Series 1930 Number 34

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Crawford County, Wisconsin

By

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Wisconsin Geological and Natural History Survey

Bureau of Chemistry and Soils

In cooperation with the
Wisconsin Geological and Natural History Survey
and the University of Wisconsin College of Agriculture

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SOIL SURVEY OF CRAWFORD COUNTY, WISCONSIN

By M. J. EDWARDS, in Charge, and W. J. GEIB, United States Department of Agriculture, and OLAF LARSON, E. H. TYNER, and D. E. WILCOX, Wisconsin Geological and Natural History Survey

COUNTY SURVEYED

Crawford County is in southwestern Wisconsin (fig. 1), northeast of the junction of Wisconsin and Mississippi Rivers, which form the southern and western boundaries, respectively. The most southerly point on the eastern boundary is 50 miles north of the Illinois State line and 70 miles west of Madison. The northern boundary is approximately 30 miles south of La Crosse, and Prairie du Chien, the county seat, is 55 miles south of La Crosse by rail. The area of the county is 588 square miles, or 376,320 acres.

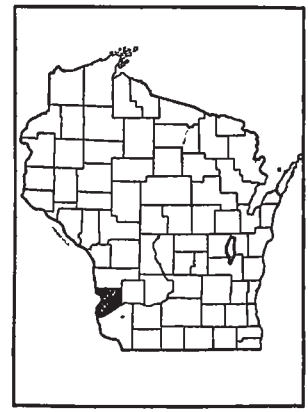

FIGURE 1.—Sketch map showing location of Crawford County, Wis

The greater part of the county is a deeply dissected plateau or plain. The valleys are comparatively narrow and steep sided, and the ridges, which are gently rolling or rolling, range in width from ¼ to 1½ miles. The rest of the county is included in the flood plains of Mississippi and Wisconsin Rivers.

With the exception of the Wisconsin River Valley, the topographic features are roughly parallel and extend in a north and south direction. From west to east they are (1) the Mississippi River gorge, (2) a central ridge that is a southern extension of the broader ridge in Vernon County, (3) the Kickapoo River Valley, and (4) a smaller but prominent ridge east of the Kickapoo River Valley.

The Mississippi River Valley is gorgelike. The valley floor on the Wisconsin side of the river ranges in width from practically nothing near De Soto and Lynxville to 2¼ miles at Ferryville. The adjoining upland, with the exception of the interior drainage valley outlets, rises abruptly to an elevation ranging from 300 to 550 feet above the valley floor. North of the confluence of Wisconsin River with Mississippi River lies a terrace, or second-bottom land, which ranges in width from ¼ mile to 1⅓ miles and includes about 7 square miles. It ranges from 10 to 35 feet in elevation above Mississippi River with the greater elevation at the southern edge, and its surface relief is nearly level or gently undulating.

Kickapoo River, like the Mississippi, flows through a steep-walled or gorgelike valley. The valley floor is about one-fourth mile wide

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and is occupied largely by first-bottom land or low-lying terraces (pl. 1, *A*). A few notable exceptions occur at Haney and Citron Valleys, which are old cut-off river channels or gorges now occupied by terraces lying about 25 feet above the adjoining river-bottom lands. The valley walls of Kickapoo Valley are mainly steep rocky slopes having a variable quantity of colluvial material at their bases. The relief in this part of the county is slightly less than that along Mississippi River, ranging from about 300 to 480 feet above the river.

The smaller streams completely ramify the ridge lands and have deep steep-sided valleys. They are comparatively short, and few of them have valley floors more than one-fourth mile wide. Richland Creek and Sugar Creek are the only smaller streams that have a notable extent of terrace or second-bottom land along their courses.

The ridge lands have gently rolling or rolling surface relief. The two main north and south ridges have more extensive gently rolling areas than the smaller ridges. The ridge land of the western half of the county (that part west of Kickapoo River) is underlain by Galena-Trenton limestone, a comparatively thin layer of St. Peters sandstone, and lower magnesian limestone. These formations occur from above downward in the order given. From the vicinity of Seneca southward, the greater part of the ridge land overlies the Galena-Trenton formation, but numerous small side ridges occur as benches, the soils of which are underlain by lower magnesian limestone. These short ridges are separated from the main ridges by a short comparatively steep escarpment of St. Peters sandstone, as in sec. 15, T. 8 N., R. 6 W., 3 miles west of the village of Eastman. Northward from Seneca, only an irregular part of the central ridge is capped with Galena-Trenton limestone, and some of the more extensive ridges, as well as the smaller ones, lie on the lower magnesian limestone and are separated from the Galena-Trenton areas by short but steep escarpments of St. Peters sandstone, as at Mount Sterling and at Rising Sun. At Mount Sterling only an isolated butte, or mesa, capped with the Galena-Trenton limestone remains, but at Rising Sun this formation is somewhat more extensive. All the extensive ridges to the east and west lie below and on lower magnesian limestone.

The relief of the ridge land immediately east and south of Steuben is similar to that in the vicinity of Rising Sun. That part of the county east of Kickapoo River and north of Gays Mills is somewhat more irregular or choppy and has less range in relief than most of the rest of the upland part of the county.

Extending eastward from Prairie du Chien to a point about 2½ miles east of Bridgeport is a high well-dissected terrace, or shelf, of Wisconsin River. Here, the surface relief ranges from undulating to rolling, and the terrace lies about 100 feet above the bottom land along the river. Remnants of this terrace also occur in the vicinity of Wauzeka.

The following tabulation gives the elevations above sea level of different points in the county, as shown on the topographic sheets of the United States Geological Survey:

	Feet
Wisconsin River, at confluence with Mississippi River	615
Prairie du Chien (approximate elevation of terrace)	640
Bridgeport School (old Wisconsin River shelf, or terrace)	769
Eastman (ridge land in southern part of county)	1,224
Vernon County line, on main ridge north of Rising Sun	1,188
Gays Mills (upper Kickapoo Valley)	702
Highway corner, 3 miles east of Gays Mills	1,167
Highway, at Richland County line along Wisconsin River	666
Harmony Hill, T. 9 N., R. 3 W	1,105

The native vegetation of the uplands of Crawford County consists essentially of hardwoods, among which white oak and black oak predominate. East of Kickapoo River, especially in the vicinity of Rolling Ground and Horrigan Ridge, sugar maple and basswood predominate. Scattered throughout the county are shagbark hickory, bitternut hickory, butternut, walnut, birch, poplar, elm, and cherry. A small quantity of hemlock is scattered along the steep slopes of Kickapoo Valley. Where the virgin timber has been cut, the land has reforested with quaking aspen, ironwood, hazel brush, and a second growth of the original species; and where the land has been kept cleared, bluegrass and white clover establish themselves readily. The native vegetation of the stream bottoms consists of soft maple, willow, elm, and golden birch. Most of the bottom land along Wisconsin and Mississippi Rivers is still timbered, as are also some extensive tracts along Kickapoo River, but most of the smaller stream flood plains have been cleared, and here the native vegetation is bluegrass and white clover. The wettest areas of the bottom lands support a native vegetation of sedges or reeds.

The first settlement in Crawford County took place in 1781, at Prairie du Chien. Agricultural development, however, was confined to the prairie in that immediate locality until about 1840. In 1839, pioneers settled at Eastman and in Gran Grae Valley, and settlement started in the eastern part of the county in 1844. Most of the pioneers came from Ohio and the Eastern States. About 1850, foreign settlers began to locate. Practically all the present inhabitants are of northern European descent, largely Norwegians, Irish, Germans, Bohemians, and English, and throughout much of the county the nationalities are intermixed. The Norwegians predominate in the northern part, Bohemians in the vicinity of Prairie du Chien, and Irish in the vicinity of Rolling Ground. The 1930 census reports the total population as 16,781, of which 3,943 are urban inhabitants and 12,838 rural.

Transportation facilities are good. The Chicago, Burlington & Quincy Railroad serves the western part of the county and the Chicago, Milwaukee, St. Paul & Pacific Railroad serves the southern and interior parts. Few places are more than 10 miles from a shipping point. Most of the State highways are graded and are surfaced with gravel or crushed rock. The county trunk highways are graded, some of the most heavily traveled parts being graveled, and additional mileage is graveled from time to time.

About 85 percent of the farm homes have telephones, and the rural districts are well supplied with schools and churches. There are only a few manufacturing industries, other than the manufacture of butter and cheese. Practically all the market milk is manufactured into butter and American cheese in local factories widely distributed

over the county. Other industrial activities are a canning factory (tomatoes and sauerkraut), a woolen mill, and a woodenware factory, all of which are located in Prairie du Chien, and a cheese-box factory at Wauzeka. Some commercial fishing is done at Lynxville and Ferryville, and the fish are shipped to eastern markets. Some railroad ties, hardwood lumber, and cordwood are cut from the timber, and most of the material for the box factory comes from the first-bottom timberlands.

CLIMATE

The climate is continental and is characterized by moderately long cold winters and short but warm summers. The humidity, as compared to oceanic humidity, is low. Rapid temperature changes are common, as there are no prevailing winds controlled by a large body of water. The variation in temperature during all seasons is wide; the usual range during the coldest months is from about 55° to −25° F.; and during the warmest (summer) months from 48° to 95°; but extremes beyond these ranges are not infrequent. The coldest periods of winter are generally of 2 or 3 days' duration and are followed by gradually rising temperature. Hot spells are invariably experienced during the summer, but only occasionally do they last more than a few days.

Climatic data indicate that the northeastern part of the county has a shorter frost-free season than does the southwestern part. Owing to better air drainage, the frost-free season is longer on the ridge than on the lower lying valley land. The frost-free season, however, is not so short in any part of the county, except on the stream bottoms, as to prevent the profitable growing of corn, although frost occasionally does some damage to the crop. The common use of silos acts as a guarantee against severe losses of the corn crop through untimely frosts. The tobacco crop occasionally suffers from early fall frosts, and fruit from late spring frosts. The average length of the frost-free season at Prairie du Chien is 167 days, from April 25 to October 9—the average dates of the latest and earliest frosts—but frost has been recorded as early as September 17 and as late as May 31. Winter wheat and new seedings of red clover and alfalfa are sometimes damaged because of injury to the roots by alternate freezing and thawing during winter and early spring.

The rainfall is adequate and well distributed for crop production. About 70 percent of the total annual precipitation falls during the growing season, between April 1 and September 30. Short periods of drought sometimes occur during July and August, and they interfere to some extent with the proper growth and development of crops, but severe droughts seldom last more than 10 days and very seldom cause the total loss of any one crop. Shallow-rooted permanent pasture grasses are generally the first crops to suffer from dry weather, and grazing on these grasses sometimes becomes scant during July and August. Diversified farming, however, under the prevailing climatic conditions, practically insures good yields from some, if not all, of the crops grown.

Table 1 gives the more important climatic data for Crawford County, as compiled from the records of the United States Weather Bureau station at Prairie du Chien.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Prairie du Chien, Crawford County, Wis*

[Elevation, 628 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1895)	Total amount for the wettest year (1902)	Snow, average depth
	°F	°F	°F	Inches	Inches	Inches	Inches
December	23 3	60	−23	1 31	2 04	3 37	7 3
January	17 4	66	−34	1 08	1. 45	58	8 8
February	20 8	61	−31	1 09	50	1 08	7 6
Winter	20 5	66	−34	3 48	3 99	5 03	23. 7
March	33 8	89	−12	1 81	61	2 39	5 4
April	48 5	94	13	2 63	55	1 80	1 3
May	59 9	97	23	3 74	3 12	11 84	(1)
Spring	47 4	97	−12	8 18	4 28	16 03	6 7
June	68 8	102	34	4 17	1 67	6 57	.0
July	73 7	110	38	3 52	1 44	8 88	0
August	70 9	106	35	3 83	2 09	1 65	0
Summer	71 1	110	34	11 52	5 20	17. 10	0
September	63 6	100	20	3 86	2 48	3 73	.0
October	51 8	89	10	2. 20	.95	1 22	.3
November	36 6	84	−10	1 70	1 55	1 53	2 1
Fall	50 7	100	−10	7 76	4 98	6 48	2 4
Year	47 4	110	−34	30 94	18 45	44 64	32 8

[1] Trace

AGRICULTURE

Agriculture in Crawford County during the first decades following its settlement was devoted mostly to the production of subsistence crops for the household and wheat for market. Livestock was raised for home consumption, but not until the development of lines of transportation did livestock production become an important source of farm income, and by 1900, livestock production had become more important than grain production. Livestock is raised both for meat production and dairy products. During the early years meat production was of more importance, but during recent years dairy products are more important.

With the development of livestock farming, particularly dairying, an increased acreage was devoted to forage crops and more attention was given to their improvement. The Federal census statistics show a marked increase in the acreage of legume hay, especially red clover and alfalfa. A few supplementary cash crops have been grown during the last 3 or 4 decades. Tobacco is a well-established cash crop in the northern part of the county and is grown to less extent throughout the eastern part, including the Kickapoo Valley, but very little is grown in the southwestern part. Tobacco has shown a continuous increase since 1880. Small acreages of cabbage and tomatoes are grown in the vicinity of Prairie du Chien for canning, and cucumbers for pickling are grown in the Kickapoo Valley. Apple and cherry orchards are well established locally in the vicinity of

Gays Mills. Some maple sirup is produced in the eastern part of the county, but, owing to removal of the trees, the annual yield is decreasing.

Table 2 gives the acreage and yield of the principal crops grown in Crawford County, as reported by the Federal censuses, from 1879 to 1929.

TABLE 2.—*Acreage and production of the principal crops in Crawford County, Wis., in stated years*

Crop	1879		1889		1899	
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
Corn	18,029	569,150	18,152	531,958	23,536	833,420
Oats	13,027	374,364	26,097	793,478	31,082	924,620
Wheat	26,409	335,279	12,807	169,284	9,983	140,840
Rye	1,478	19,610	2,476	35,265	2,218	28,230
Barley	1,715	28,150	903	20,435		
Buckwheat	340	4,168	676	7,320	423	5,940
Potatoes		139,714	1,449	149,812	1,310	136,742
		Tons		*Tons*		*Tons*
Hay	15,963	20,189	25,100	29,270	32,369	42,080
Silage crops						
Coarse forage					893	1,216
		Pounds		*Pounds*		*Pounds*
Tobacco	23	14,645	47	59,822	1,121	1,509,830
	Trees	*Bushels*	*Trees*	*Bushels*	*Trees*	*Bushels*
Apples			20,656	27,752	55,801	16,858
	Vines	*Pounds*	*Vines*	*Pounds*	*Vines*	*Pounds*
Grapes					2,606	11,267

Crop	1909		1919		1929	
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
Corn	23,027	711,410	24,307	1,004,328	[1] 18,580	632,851
Oats	21,427	593,420	22,493	630,639	[2] 19,238	549,037
Wheat	2,968	48,836	6,031	77,108	1,163	20,267
Rye	692	8,610	581	7,697	175	2,480
Barley	5,810	134,019	4,334	87,074	5,317	131,977
Buckwheat	396	5,641	240	3,721	69	955
Potatoes	1,237	137,894	1,055	71,430	799	78,566
		Tons		*Tons*		*Tons*
Hay	44,607	60,952	69,720	47,136	53,087	83,221
Silage crops			1,563	12,350		
Coarse forage	975	1,647	7,418	11,157		
		Pounds		*Pounds*		*Pounds*
Tobacco	2,491	2,743,972	2,089	2,347,960	2,403	2,712,906
	Trees	*Bushels*	*Trees*	*Bushels*	*Trees*	*Bushels*
Apples	43,817	46,374	34,650	17,258	43,228	47,576
	Vines	*Pounds*	*Vines*	*Pounds*	*Vines*	*Pounds*
Grapes	3,561	3,576	5,051	40,318	1,442	12,133

[1] In addition, corn from 5,982 acres was cut for silage, yielding 51,906 tons, that from 833 acres was cut for fodder, and that from 1,290 acres was hogged off

[2] In addition, oats from 259 acres were cut and fed unthreshed

The use of commercial fertilizers, although still not common, has increased rapidly during the last decade, and the use of crushed limestone for alfalfa has also increased rapidly. This lime is procured from local quarries and from commercial quarries outside the county. Most of the fertilizer used is in the form of complete fertilizer for cultivated crops. According to the Federal census, $18,174 were spent for fertilizer on 332 farms in 1929. According to the Crawford County agricultural agent's annual report for 1930,

about 350 tons of commercial fertilizer and more than 3,000 tons of crushed limestone were used by the farmers in that year.

Most of the laborers are native-born whites who are fairly capable and, except during the busiest seasons of the year, are not difficult to obtain. Day wages for ordinary farm work range from $1.25 to $2.25, and for special work, such as tobacco harvesting, from $2.50 to $3.50. When hired by the month, including board and room, laborers receive from $35 to $60. The lower wage rate applies to the less capable laborers and to the slack months of the year.

According to the Federal census, the average size of the farms has been fairly stable since 1910, but before that date, the average size showed a gradual increase. Although the average size of the farms is given as 171.3 acres in 1930, the range in size of most of the farms is from about 80 acres to 700 acres. Only two farms include more than 1,000 acres. As a rule, the smaller farms are on the broader ridges where most of the land is tillable, whereas most of the large farms (from 350 to 600 acres) are located in those parts of the county where less than 60 percent of the land is tillable.

In 1930, there were 1,367 farms operated by owners, 532 by tenants, and 16 by managers. Of the 532 farm tenants, 133 were cash tenants, and the rest were share tenants. Probably the most common system of share rental is for the owner to furnish the land, buildings, half of the productive livestock, and all the grass seed; the tenant furnishes the labor, work animals, and half of the productive livestock; and the proceeds are divided equally between owner and tenant. On some farms, the owner furnishes all the productive livestock. Where a tract of land is rented for tobacco growing, the owner furnishes the land, manure, and half of the seed; the renter furnishes the labor; and the proceeds are divided equally.

The well-operated farm in Crawford County demands a rather extensive and complete supply of equipment; good barns for housing all livestock and feed are prime requisites; housing facilities for machinery are also valuable and common equipment; and during the last 10 years the silo has become a necessary adjunct to the best dairy farms. According to the 1930 Federal census, the average value of buildings, including the farmer's dwelling, was $3,354 a farm. Of the 1,915 farms in the county in 1930, 1,381 had telephones, 218 had water piped to the dwelling, and 280 were lighted by electricity. Automobiles on farms numbered 1,873, tractors 321, electric motors for farm work 112, and stationary gas engines 1,025. The farm machinery on the average farm includes single and gang plows, disk harrow, grain drill, corn planter, cultivators, mower, reaper, manure spreader, wagons, and a small stationary gas engine. Practically all the farms that are not supplied with a good spring, have a good well and either a windmill or a gas engine for pumping. Less universal but, nevertheless, common equipment includes a corn binder, light truck, tractor, electric current (supplied either from an individual plant or power line), and feed grinder. Patrons of the creameries have their own cream separators. Silo fillers, grain separators, and corn huskers are operated and owned either by individuals or cooperatively by a small group of farmers. Practically all the farms have good fences. All pasture land is fenced, and most cropped fields are separated by cattle-proof fences, although in some localities where the farms include sufficient nontillable land to fur-

nish grazing the entire summer, the cropped fields are not separated by fences, because the only time cattle run on these fields is late in the fall after all crops have been harvested.

Of the 34,000 cattle in Crawford County on January 1, 1928, as reported by the Wisconsin Department of Agriculture in Bulletin 90,[1] 22,900 were milk cows and heifers over 2 years of age. They are well distributed over the county, and dairying is the chief agricultural industry. The principal breeds of dairy cattle are Holstein-Friesian, Brown Swiss, and Guernsey, and some Jersey and milking Shorthorn herds are kept. Most of the cattle are of mixed breeding. Constant improvement of the dairy herds through selection and the use of purebred sires is very evident.

As has been stated, the milk is made up into butter and American cheese in local factories. According to the Wisconsin Department of Agriculture Bulletin 90, 9 creameries and 30 cheese factories were in the county in 1927. Most of the cheese factories are in the eastern half of the county, whereas most of the creameries are in the western half. Some dairy animals are shipped out of the State for milking and breeding purposes.

In addition to the dairy cattle, some breeding of beef cattle is carried on. Most of these cattle are of Hereford and Shorthorn breeds, and it is common practice of many farmers (those that have cattle other than high-grade and purebred dairy cattle) to raise a few head of young cattle for beef. Most of the animals raised for beef are spring calves that are held through two winters and then sold the following fall direct from pasture. Practically no feeding or finishing of beef cattle is practiced.

According to the same bulletin, there were 23,500 hogs on the farms of Crawford County in 1927. Hogs are well distributed over the county. Although a few farmers do not raise any, and there are few large farms devoted entirely to hog raising, most of the hogs are raised as a secondary industry on the dairy farms. The average-sized herd on a dairy farm is about 12 head. Most of the pigs are farrowed in the spring and marketed at ages ranging from 6 to 10 months, but some fall-farrowed pigs are sold on the market the following spring and summer. Spring pigs are run on pasture and fed a comparatively light ration until the fall grain is available for feed. Corn is the most common fattening feed, although some barley and oats are used. Poland China and Duroc-Jersey are the predominant breeds of hogs.

The same bulletin states that there were 6,400 sheep in the county in 1927. Although sheep raising is a comparatively minor industry, it appears to be well distributed. Lambs are dropped in the spring and are fattened for the winter market. Most of the sheep are of dual-purpose breeds raised for both wool and mutton.

Practically every farm has a flock of chickens. The size of the flock ranges from 40 to 300 fowls. The total number of chickens on farms April 1, 1930, was 121,685. In addition to chickens, ducks, geese, and turkeys are raised to some extent throughout the county. Most of the poultry and eggs are marketed through local retail dealers. The most common breeds of chickens are White Leghorn and Barred Plymouth Rock.

[1] EBLING, W H WISCONSIN AGRICULTURE, A STATISTICAL ATLAS, 1926–27. Wis. Dept. Agr. Bull. 90, 102 pp., illus. 1928.

SOILS AND CROPS

The soils of Crawford County may be placed, on the basis of dominant agricultural characteristics in five groups, as follows: (1) Ridge-land soils, including Clinton silt loam, Clinton silt loam, steep phase, Dubuque silt loam, Dubuque silt loam, deep phase, Dubuque silt loam, steep phase, Tama silt loam, Boone silt loam, and Boone silt loam, steep phase; (2) valley soils, including Boone silt loam, valley phase, Boone loam, Boone fine sandy loam, Clinton silt loam, valley phase, and Bates silt loam; (3) heavier soils of the terraces, including Bertrand silt loam, Bertrand silt loam, heavy-subsoil phase, Bertrand silt loam, rolling phase, and Waukesha silt loam; (4) sandy soils, including Boone fine sand, Bertrand fine sandy loam, O'Neill fine sandy loam, O'Neill sandy loam, O'Neill loamy sand, and Sparta loamy fine sand, brown phase; and (5) first-bottom soils, including Ray silt loam, Ray fine sandy loam, Wabash silt loam, Wabash fine sandy loam, and alluvial soils, undifferentiated.

Rough broken land is a miscellaneous classification not properly included with any soil group.

The crops grown may be divided into two groups—feed crops and cash crops. The feed crops are the most important, both in acreage and farm value, and they include hay, oats, barley, and corn.

The dominant hay crops are timothy and clover mixed, alfalfa, and small quantities of mammoth clover and alsike clover. Timothy and medium-red clover are grown on practically all the well-drained soils, except Boone fine sand and Sparta loamy fine sand, brown phase. Alfalfa is grown on the well-drained soils, but a larger acreage is grown on the valley soils than on the ridge-land soils. Alsike clover and timothy are grown on the better drained areas of the first-bottom soils as well as on the well-drained upland soils. Mammoth clover, except where it is being produced for green manure, is grown almost wholly on the sandy soils. Some sweetclover is grown successfully on most of the upland soils for pasture, hay, and especially for green manure.

Oats are the most important small-grain crop. Most of the acreage of this crop is on the ridge-land soils, particularly on Clinton silt loam and Dubuque silt loam, deep phase. Oats are also grown in regular rotation on some of the higher areas of the terrace soils, but only very small acreages of the valley soils and the sandy soils are devoted to this crop. Barley and wheat (the latter being largely a cash crop) are grown on much the same soils as are oats. The acreage of barley during recent years is showing a steady increase. Barbless barley has been widely introduced and has proved to be as productive as the barbed varieties. The dark-colored soils (Waukesha silt loam and Tama silt loam) are particularly well suited to wheat, but oats are rather inclined to lodge on these two soils, especially on Waukesha silt loam.

Rye is a feed crop of slight importance, grown almost wholly on the soils of the sandy group. Most of its acreage is in the Kickapoo Valley.

Corn is grown on practically all the tillable soils. A small proportion of this crop is grown on Sparta loamy fine sand, brown phase, and Boone fine sand. Whereas oats are largely confined to the ridge-land soils, corn is well adapted to and extensively grown

on the valley soils. Although the valley soils seem to be better adapted to corn production than the ridge-land soils, good crops of corn are produced on the smooth deep soils of the ridge lands, especially on Clinton silt loam and Tama silt loam. Corn is also an important crop on the heavier soils of the sandy group, and it is grown extensively in the stream bottoms on the better drained areas of the Ray and Wabash soils.

Tobacco is the most important cash crop (pl. 1, *B*). A large part of this crop is grown in the central and northern parts of the county, and a more scattered acreage is in the Kickapoo Valley and throughout most of the section east of Kickapoo River, but very little or none is grown in the southwestern quarter. The distribution of this crop is not entirely due to soil differences or characteristics but rather to such local causes as the contact of neighbors, national origin of the people, the familiarity of buyers with a given section, and the accessibility to warehouses. The prime requisite in growing tobacco is a fairly well drained and fertile soil that has good water-holding capacity. The important tobacco soils of the ridge-land group are Clinton silt loam, Dubuque silt loam, deep phase, and Tama silt loam; of the valley soils are Bates silt loam and Clinton silt loam, valley phase; and the best and most commonly used terrace and first-bottom soils are Bertrand silt loam, Waukesha silt loam, and the better drained areas of Ray silt loam and Wabash silt loam.

Apples are grown commercially in a localized area east of Gays Mills, in company projects. These orchards, which occupy about 1,400 acres, are located almost wholly on Clinton silt loam, Dubuque silt loam, deep phase, and the steep phase of Dubuque silt loam where the soil is deep. Good air drainage, good surface soil and subsoil drainage, and a comparatively deep silty soil make these soils well adapted to apple growing. There are many small farm orchards throughout the county, but, mainly because of lack of care, they are not producing profitably. A small acreage is devoted to cherries which are grown commercially in conjunction with the Gays Mills apple orchards. Some of the cherry orchards are on Boone fine sandy loam.

Tomatoes, cabbage, and cucumbers are cash crops of minor importance. Tomatoes are produced on Waukesha silt loam, O'Neill fine sandy loam, and O'Neill sandy loam, in the immediate vicinity of Prairie du Chien, and they are marketed at the canning factory at that place. Waukesha silt loam generally returns the best yields, but during excessively wet seasons O'Neill fine sandy loam and O'Neill sandy loam produce the most satisfactory crops. Cabbage is grown on the well-drained terrace and alluvial soils that are not acid. The principal areas devoted to cabbage are at the mouth of Campbell Coulee, about 1½ miles northeast of Prairie du Chien. This crop is marketed at the canning factory. These two crops (tomatoes and cabbage) are localized mainly because of the market facilities. Cucumbers are grown mainly in the Kickapoo Valley, because most of the soils here are sandy loams and because the available salting stations are located along the railroad that follows the valley. They are a cash crop, particularly well adapted to sandy soils, but frequently grown on heavier soils.

Clover seed and alfalfa seed are grown to some extent throughout most of the county. The size of the crop depends considerably on

whether or not the season is favorable for the development of seed. Medium red is the clover most commonly grown for seed. The first crop of the season is cut for hay, and the second crop is often cut for seed. During recent years, some alfalfa seed has been harvested. According to the county agricultural agent's annual report for 1930, about 200 bushels of alfalfa seed were harvested in that year. The 1930 Federal census reports the yield of clover seed in 1929 as 2,778 bushels. The yield of each of these crops ranges from 1 to 3 bushels an acre.

Other crops of less importance, but nevertheless commonly grown, are potatoes, timothy seed, rape, turnips, dry peas, soybeans, and melons. Potatoes are grown on practically all farms and all soils, except Dubuque silt loam, Boone fine sand, Sparta loamy fine sand, brown phase, undifferentiated alluvial soils, and the poorly drained areas of the Ray and Wabash soils. Fine sandy loams and loams are favored for this crop. Most of the potatoes are used for home consumption, with only a small and irregular surplus for market. Rape and turnips are sown widely for late summer and fall pasture for hogs, cattle, and sheep. Soybeans are grown for both hay and seed. Most of the melons are grown on the sandy loams and loamy fine sands.

The most common garden crops, in addition to the ones mentioned, are carrots, rutabagas, beets, sweet corn, onions, and radishes. Some strawberries and raspberries are grown, very small quantities of which are marketed locally.

In the following pages the soils of Crawford County are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 3.

TABLE 3.—*Acreage and proportionate extent of soils mapped in Crawford County, Wis*

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Clinton silt loam	35,648	9 5	Waukesha silt loam	1,856	0 5
Clinton silt loam, steep phase	31,424	8 4	Boone fine sand	1,728	4
Tama silt loam	576	1	Bertrand fine sandy loam	1,152	3
Dubuque silt loam	2,176	6	O'Neill sandy loam	1,600	4
Dubuque silt loam, deep phase	11,520	3 1	O'Neill fine sandy loam	576	1
Dubuque silt loam, steep phase	84,800	22 5	O'Neill loamy sand	1,152	3
Boone silt loam	1,216	3	Sparta loamy fine sand, brown phase	1,408	4
Boone silt loam, steep phase	6,016	1 6	Ray silt loam	22,592	6 0
Boone silt loam, valley phase	10,688	2 8	Ray fine sandy loam	6,272	1 7
Boone loam	1,920	5	Wabash silt loam	3,648	1 0
Boone fine sandy loam	4,352	1 1	Wabash fine sandy loam	64	1
Clinton silt loam, valley phase	1,536	4	Alluvial soils, undifferentiated	29,696	7 9
Bates silt loam	896	2	Rough broken land	106,432	28 3
Bertrand silt loam	2,176	6			
Bertrand silt loam, rolling phase	2,496	7	Total	376,320	
Bertrand silt loam, heavy-subsoil phase	704	2			

RIDGE-LAND SOILS

The ridge-land group includes those light-colored soils with smooth silt loam surface soils and heavier subsoils, which occupy the ridges in the upland part of the county. Tama silt loam differs from this general description, as the topsoil, to a depth of about 14 inches, is distinctly darker colored and has a much higher content of organic

matter than do the other soils of the group. The reaction of the surface soils of the soils of this group is medium acid, and of the subsoils ranges from medium to strongly acid.

Clinton silt loam.—Clinton silt loam is one of the dominant and one of the most important farming soils of the county. The surface soil, to a depth of 8 inches, is light-brown or grayish-brown smooth silt loam. Below this layer and extending to a depth of about 18 inches, the material is yellowish-brown smooth silt loam. This layer is underlain by heavier and more compact silt loam or silty clay loam, that crumbles to cubelike pieces when the mass is broken. Below a depth of 32 inches, the material is yellowish-brown (slightly lighter colored than the material in the layer above) soft velvety silt loam which extends to a depth ranging from 40 to 100 or more inches and is underlain by limestone or sandstone.

The surface soil, to a depth of 18 inches, is in general medium acid, and the heavy subsoil, in most places, strongly acid. Below a depth of 70 inches, the acidity diminishes to a medium acid or slightly acid reaction.

The surface relief ranges from undulating to gently rolling, and both surface drainage and subsoil drainage are good.

The aggregate area of Clinton silt loam is 55.7 square miles. It is most extensive in the western half of the county, and only a few small areas occur east of Kickapoo River.

Between 85 and 95 percent of the land is cleared and used either for general-farm crops or as improved grazing land. About 25 percent of the area, including all the timbered part, is used for grazing purposes. Small grains (mainly oats) occupy from 20 to 25 percent, hay crops from 20 to 25 percent, and corn from 15 to 20 percent of the acreage of this soil.

Clinton silt loam is a productive soil, and all general-farm crops yield comparatively well. With good soil management, oats yield from 40 to 45 bushels an acre, but on some poorly farmed areas, yields are as low as 25 or 30 bushels. With proper fertilization, in favorable seasons, from 60 to 70 bushels an acre have been reported. With good soil management, corn yields from 40 to 50 bushels an acre, barley from 35 to 40 bushels, and wheat from 20 to 30 bushels. The most common hay crop, mixed timothy and clover, yields from 1¼ to 2½ tons an acre, and alfalfa from 3 to 4½ tons, although higher yields of alfalfa are occasionally obtained. Tobacco is successfully grown on this soil, and yields range from 1,200 to 1,600 pounds an acre, although occasionally crops averaging more than 1,800 pounds are obtained. Medium red clover yields from 1½ to 2 bushels of seed an acre when the season is favorable for seed development. The apple orchards in the vicinity of Gays Mills are located partly on Clinton silt loam.

Clinton silt loam, steep phase.—The steep phase of Clinton silt loam differs from the typical soil only in slope which has a gradient ranging from 14 to 30 percent. In most tilled areas the surface soil has been partly or wholly removed by erosion, leaving the less arable subsoil exposed for cultivation (pl. 2, *A*).

This soil is associated with the smoother areas of typical Clinton silt loam, and it occurs most extensively throughout the western half of the county, along the edges of the ridge tops, and, on some of the narrower ridges, covers the ridge top as well. About 75 percent

of this steep land is tilled, and practically all the untilled part is pastured. Small grains (mainly oats) occupy about 20 percent of this soil, hay from 20 to 30 percent, and corn and tobacco less than 10 percent.

Tama silt loam.—Tama silt loam is the dark-colored silt loam soil occurring on the ridges. The surface soil is noticeably darker than that of Clinton silt loam. To a depth of about 9 inches, the soil material is dark-brown or nearly black soft friable silt loam, and below this depth the color becomes a lighter shade of brown. At a depth of about 15 inches, the soil material becomes firmer, has a heavy silt loam or silty clay loam texture, and breaks readily to irregular but firm soil fragments. Below a depth of 20 inches, the material differs widely in different locations. Where the depth to bedrock is slight, reddish-brown clay, that breaks readily to angular fragments, may occur below a depth of 18 or 20 inches, and below this material, bedrock of limestone occurs at a depth ranging from 25 to 45 inches. In places where the depth to bedrock is greater, the brown heavy silt loam material extends to a depth of about 35 inches, and below this layer, the material becomes soft yellowish-brown silt loam that is, in most places, mottled with yellow and gray below a depth of 45 inches. The reaction of Tama silt loam is medium acid, and the reddish-brown clay, that underlies the soil in places, is strongly acid.

The surface relief over most of this soil is gently sloping, except where the soil extends to the extreme outer edges of the ridges or down the upper ends of the drainageways. In such places small areas have steep relief and most of them are shallow. Both surface and subsurface drainage are good.

The aggregate area of Tama silt loam is 0.9 square mile. Practically all this soil is on the ridge top in the vicinity of Mount Sterling.

Except where the relief is steep, Tama silt loam is one of the most desirable agricultural soils of the county, and practically all the land is tilled. The smooth areas are extensively devoted to, and are fairly well adapted to, the production of corn and tobacco. Small acreages are devoted to grain and hay, but very little of the smoother land is used for grazing.

Yields of crops on Tama silt loam are equal to, and in some seasons are greater than, yields obtained on Clinton silt loam. Two possible exceptions may be the yields of oats and barley, as under unfavorable weather conditions, these crops may lodge more readily on Tama silt loam than on Clinton silt loam.

The recommendations for cropping and improving this soil are similar to those given for cropping and improving Clinton silt loam. The steeper areas, however, should be handled according to the recommendations given for the culture of Clinton silt loam, steep phase.

Dubuque silt loam.—Dubuque silt loam is characterized by a shallow light-colored silt loam surface layer and a heavy red clay lower subsoil layer. The surface soil, to a depth of about 7 inches, is light-brown or grayish-brown smooth friable silt loam. Below this and extending to a depth ranging from 10 to 16 inches, the material is yellowish-brown silt loam or silty clay loam. This layer is underlain by a layer of reddish-brown cherty clay that overlies limestone at a depth ranging from 2 to 4 feet below the surface. The reaction

of the entire profile ranges from medium to strongly acid. Several small areas in the western part of the county have a dark-brown silty clay loam or clay surface layer underlain, at a depth of 4 inches, by reddish-brown clay, and this, in turn, by limestone at a depth of about 10 inches. In some places, where the Galena-Trenton limestone underlies this soil, the clay is yellow with a green tinge and is generally free from chert.

The surface configuration of Dubuque silt loam ranges from narrow, undulating ridge tops to rolling or steep ridges and ridge slopes. Most of the soil is subject to erosion when cultivated.

Practically 90 percent of this soil occurs east of Kickapoo River, especially in the southeastern quarter of the county, where it occupies many of the narrow ridge tops and edges of ridges, the crests of which are occupied by the deep phase of Dubuque silt loam. The bodies of Dubuque silt loam in the western part of the county are small, most of them occurring as shallow soil at the ends of ridges occupied by Clinton silt loam or Dubuque silt loam, deep phase.

About 75 percent of Dubuque silt loam is cleared, and about 45 percent of the land is grazed. Small grains (especially oats) and mixed timothy and clover are the dominant crops. Because the soil material is shallow and the land in general has a steep slope, this soil is not well adapted to cultivated crops. Crop yields are somewhat lower than on Dubuque silt loam, deep phase, and on Clinton silt loam. With good soil management, oats yield from 30 to 40 bushels an acre and, under exceptionally favorable circumstances, 50 bushels. Yields of mixed timothy and clover hay average about 1½ tons, and of alfalfa range from 2 to 3 tons, when the lands is treated with crushed limestone.

Dubuque silt loam, deep phase.—Dubuque silt loam, deep phase, to a depth ranging from 24 to 38 inches, is identical with Clinton silt loam. Below this depth, gritty, cherty, or stony clayey material is present, immediately beneath which is bedrock. In many places, a few limestone or chert fragments are intermixed with the soil or are on the surface, and in a few places where the soil occurs on the lower ridges immediately below narrow outcrops of St. Peters sandstone, fragments of sandstone are on the surface.

This soil has an undulating or gently rolling surface relief, and it occurs on ridge tops. It is widely distributed throughout the county except along the western edge where most of the ridge land is occupied by the Clinton soils.

Between 80 and 90 percent of the land is cleared, and it is used for the same crops as those grown on Clinton silt loam. Its productivity approaches, but does not quite equal, that of Clinton silt loam.

Dubuque silt loam, steep phase.—Dubuque silt loam, steep phase, is similar to Dubuque silt loam, except that the slope of the surface has a gradient ranging from 14 to 30 percent. In many places, the surface soil of areas of this soil that have been tilled for many years has been wholly or partly removed by erosion.

This soil is associated with Dubuque silt loam, deep phase, and Clinton silt loam. It occurs on the outer edges of the ridge tops and, where the ridges are narrow, occupies the entire ridge top. A few small areas are in the valleys, where the valley soil is underlain by limestone. This soil is widely distributed over the county, except

along the western edge. The most extensive areas lie east of Kickapoo River.

In agricultural use and productivity this soil is similar to the steep phase of Clinton silt loam, but the slighter depth to bedrock makes it somewhat less desirable than the Clinton soil. The few small areas occurring in the valleys are adapted to the same crops as are grown on the valley phase of Clinton silt loam.

Boone silt loam.—Boone silt loam is recognized by its light-colored silty surface soil and yellowish-brown heavier subsoil underlain by sandstone or shale at a depth of about 30 inches. The 8-inch surface soil consists of light-brown or grayish-brown smooth friable silt loam. Below this and continuing to a depth ranging from 22 to 36 inches the soil material is yellowish-brown silty clay loam, below which is sandy material consisting of sandstone or shale. The surface soil generally has a medium acid reaction, and the subsoil is medium or strongly acid.

The surface relief of Boone silt loam is gently rolling or rolling, and in a few places it is broken by rock patches and short steep slopes. Much of this soil occurs on hillsides, the crests of the hills being comparatively narrow. The greater part of this soil lies in the northeastern corner of the county east of Kickapoo River and north of a line drawn directly east from Gays Mills. The bodies are associated with both Clinton silt loam and Dubuque silt loam. A few areas are scattered over most parts of the county.

Probably 65 or 75 percent of the land is tilled, and the rest is grazed. Hay, corn, and oats are the principal crops, but only a small quantity of tobacco is grown, as this soil is devoted almost wholly to the production of crops necessary to dairying and livestock raising.

The average yield of oats under normal conditions is between 35 and 40 bushels an acre, corn about 40 bushels, and mixed timothy and clover hay about 2 tons. Although this soil is not so productive as Clinton silt loam or Tama silt loam, it returns good yields when good soil management is practiced.

Boone silt loam, steep phase.—The steep phase of Boone silt loam includes soil with characteristics similar to those of typical Boone silt loam, but with very rolling or steeply sloping surface relief. This phase of Boone silt loam is more subject to erosion than the typical soil and in places has lost some or all of the surface layer by erosion. A larger proportion of such land is in pasture and wood lots than of the smoother areas of the typical soil.

VALLEY SOILS

The valley soils include those soils having brown surface soils and heavier textured yellowish-brown subsoils, occurring in the valleys throughout the county. Bates silt loam differs from this general description in that its surface layer, to a depth of 18 or 20 inches, is distinctly darker and has a much higher organic-matter content than do the other soils of the group. The valley soils occur in comparatively narrow strips below the valley slopes of rough broken land and bordering the first-bottom soils of the Ray and Wabash series or the terrace soils of the Bertrand, Waukesha, O'Neill, and Sparta series. The surface relief of these soils ranges from gently to steeply

sloping. The reaction ranges from neutral or slightly acid to strongly acid. The difference in reaction is owing largely to the position of a particular area of valley soil relative to a source of lime-bearing water. If the soil area lies where lime is carried down into it the reaction is neutral, or, in a few places, actually alkaline, or sweet. As a group, the valley soils are noticeably less acid than the ridge-land soils.

Boone silt loam, valley phase.—The valley phase of Boone silt loam differs from typical Boone silt loam in that it occurs in the valleys and is made up partly of soil material that has accumulated as a result of gradually moving or working down the steep valley slopes. The surface soil, to a depth of about 5 inches, is dark grayish-brown silt loam. Below this layer, the material becomes lighter brown or grayish-brown silt loam. Rock debris is present at a depth ranging from 30 to 45 inches. The reaction of the surface soil is slightly acid or medium acid, and the subsoil is medium acid or strongly acid. Some areas occurring immediately below limestone slopes have but a slightly acid or neutral reaction.

The valley phase of Boone silt loam occurs in comparatively narrow strips along the lower slopes of valleys, bordered on the upper edge by rough broken land and along the lower edge by the first-bottom soils. The surface relief ranges from gently sloping to steep, with the steepest slopes along the upper edges of the areas bordering rough broken land.

There are no extensive bodies of this soil, but they occur throughout most of the valleys of the county, although only a few are in the southwestern quarter.

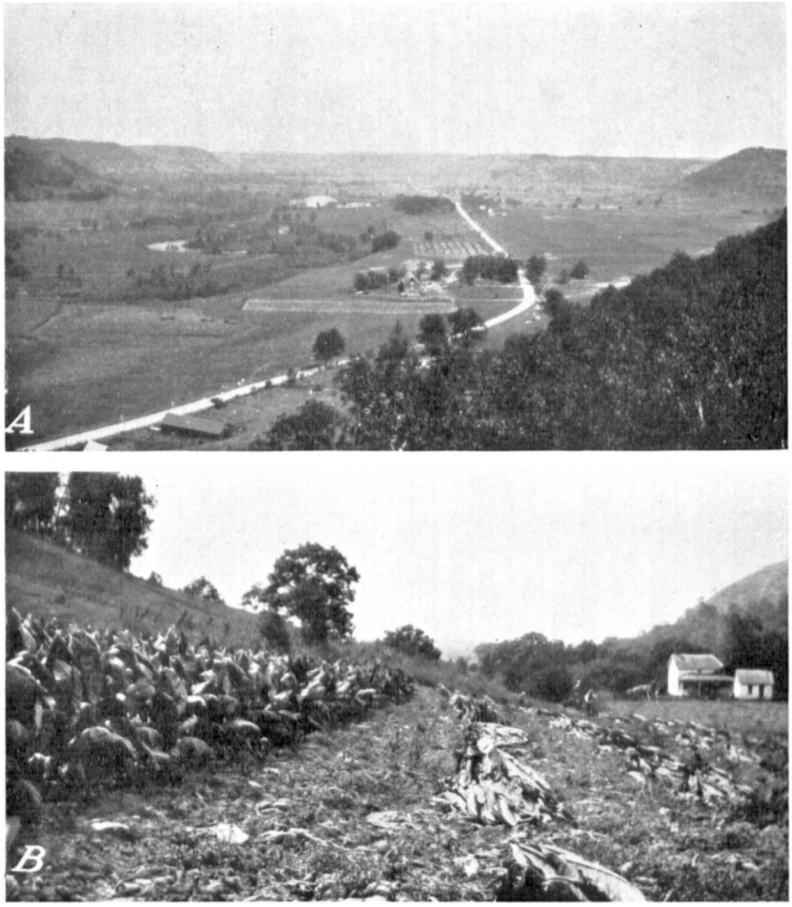
About 75 percent of the land is cleared, probably 60 percent is tilled, and practically all of the remainder is grazed. The tilled areas are devoted almost wholly to hay and corn, and a small acreage is used for the production of tobacco. Very little small grain is grown. Mixed timothy and clover hay, the most common crop grown on this soil, yields from 1 to 2½ tons an acre, alfalfa from 2½ to 3½ tons, and corn from 40 to 50 bushels.

Boone loam.—Boone loam differs from the valley phase of Boone silt loam primarily in having a loam surface soil. The subsoil in most places is similar to that of the valley phase of Boone silt loam. The reaction of the surface soil is slightly acid or medium acid, and the subsoil is medium acid or strongly acid, although some of the areas lying immediately below limestone slopes have a neutral or slightly acid reaction.

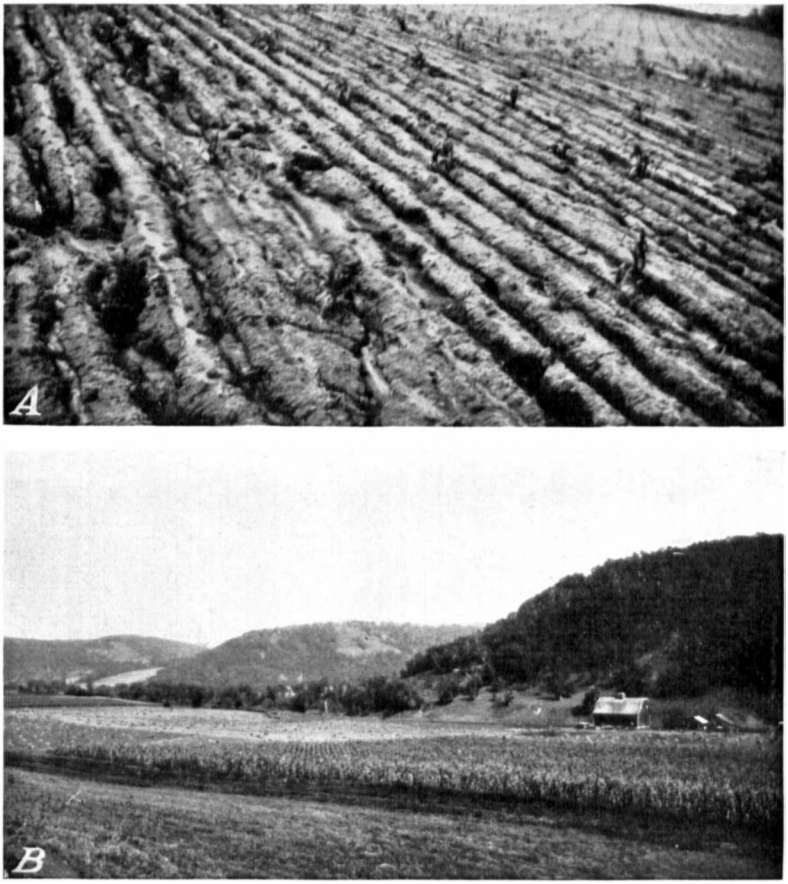
The surface relief of this soil is similar to that of the valley phase of Boone silt loam. The areas are small and scattered, but most of them occur in the vicinity of the Kickapoo Valley.

About 60 percent of this soil is tilled, and the remainder is in permanent pasture. Corn and hay are the principal crops grown, and the yields approximate those obtained on the valley phase of Boone silt loam.

Boone fine sandy loam.—In general characteristics, the profile of Boone fine sandy loam resembles those of the two valley soils already described. The surface soil, to a depth of about 4 inches, is dark-brown or dark grayish-brown fine sandy loam. Below this layer and extending to a depth of about 20 inches, the material is yellowish-



A, Kickapoo Valley, with its steep rocky valley walls and comparitively narrow valley floor, *B*, tobacco on the more fertile valley soils



A, Surface erosion caused by one spring rain, in cornfield on Clinton silt loam, steep phase, *B*, cultivated crops on Bertrand silt loam in Sugar Creek Valley

brown fine sandy loam. Below a depth of 20 inches there is a layer of yellowish-brown silt loam. Sandy rock debris is reached at a depth ranging from 24 to 40 inches. A few areas of Boone fine sandy loam have a heavy fine sandy loam rather than a silt loam subsoil at a depth of 20 inches, and in such places sandy material or sandstone is present at a depth ranging from 24 to 40 inches.

A few areas of Boone fine sandy loam on the ridges east and northeast of Gays Mills are partly or almost wholly underlain by clay. Here the upper part of the profile is loamy fine sand or fine sandy loam, and at a depth ranging from 20 to 48 inches, reddish-brown clay, identical with that occurring in the subsoil of Dubuque silt loam, is reached.

The reaction of the surface soil ranges from slightly acid to medium acid and the reaction of the subsoil from medium to strongly acid, although many areas have a neutral reaction throughout most of the profile. In areas having a clay subsoil the reaction ranges from medium to strongly acid.

The surface relief ranges from gently sloping to steep, the gradient being from 8 to 30 percent.

Most of this soil occurs as narrow strips in the Kickapoo Valley and its tributary valleys, and a few areas are in other stream valleys throughout the county. A few scattered bodies occur on the ridge land where the St. Peters sandstone outcrops. The aggregate area of Boone fine sandy loam having a clay subsoil is less than 1 square mile.

About 80 percent of the land is tilled, and the rest is devoted to grazing. Corn and hay are the principal crops, and potatoes, cucumbers, and few melons are cash crops. When the soil is maintained in a good state of fertility, corn yields from 35 to 50 bushels an acre, and mixed timothy and clover hay from 1½ to 2½ tons. Potatoes, cucumbers, and melons produce well.

Clinton silt loam, valley phase.—Clinton silt loam, valley phase, comprises those areas of Clinton silt loam that occur in the valleys, and it is recognized by its light-colored deep silt loam profile. The characteristics of its profile are identical with those of typical Clinton silt loam occurring on the ridges, except that the surface soil is in general a little darker colored. Where the soil material ranges from 10 to 12 feet in depth, the lower part generally becomes less acid, and in many places the reaction is neutral or even alkaline below this depth.

The surface relief ranges from gently rolling to rolling or steep. Most of the bodies of this soil occur as narrow steep slopes along the lower edges of valley slopes or rough broken land, mainly in the Wisconsin River Valley or in its tributary valleys.

The agricultural development, use, and adaptation of this soil are similar to those of the valley phase of Boone silt loam.

Bates silt loam.—Bates silt loam is characterized by a dark-colored surface soil and a lighter colored silty subsoil. The surface soil, to a depth of about 15 inches, is very dark brown or nearly black loam or silt loam. Below this layer, and extending to a depth of about 28 inches, the material is brown or chocolate-brown silt loam and below this depth is brown silty clay loam. At a depth of about 40 inches, the soil material is lighter brown or yellowish-brown

friable silt loam. Sandstone or limestone rock, or debris, is present at a depth ranging from 30 to 50 or more inches.

This soil in few places is very acid. Although the reaction of the surface soil ranges from alkaline to medium acid, in most places it is slightly acid. Where the subsoil extends to a depth ranging from 10 to 12 feet, it is slightly acid or alkaline in reaction.

This soil is widely distributed, occurring to some extent in practically all the larger stream valleys. Its surface relief is similar to that of the valley phase of Boone silt loam. The soil occupies inextensive strips along the lower edges of valley slopes.

About 90 percent of the land is tilled and is devoted extensively to the production of corn, hay, and some tobacco. Because of its comparatively high state of fertility and only slight acidity, the soil is particularly adapted to alfalfa, which yields from 2½ to 4 tons an acre. Mixed timothy and clover hay is also an important crop, the average acre yield being between 2 and 3 tons. Corn yields from 40 to 60 bushels and tobacco from 1,300 to 1,800 pounds.

HEAVIER SOILS OF THE TERRACES

The heavier soils of the terraces, or second bottoms, have loam and silt loam surface soils and somewhat heavier textured yellowish-brown subsoils. These soils, with the exception of one rolling phase, have nearly level surface relief, and for this reason they are comparatively free from erosion. The rolling areas are a result of the dissection of the original nearly level surface by long-continued erosion or stream action. The reaction of the surface soil materials is medium acid and of the subsoil materials is medium acid or strongly acid. In most places the acidity becomes less below a depth of about 10 feet.

Bertrand silt loam.—Bertrand silt loam is characterized by its light-colored silt loam surface soil and deep yellowish-brown silt loam subsoil. The soil profile appears very similar to that of Clinton silt loam. The 8-inch surface soil is light-brown or grayish-brown smooth friable silt loam. Below this, and extending to a depth of about 18 inches, the material is yellowish-brown friable silt loam which is underlain by heavy silt loam or silty clay loam to a depth of about 32 inches, where the material becomes lighter yellowish-brown velvety silt loam that grades within a few inches into mottled or variegated silt loam. This silty material extends to a depth ranging from 48 to 100 or more inches, where it is underlain, in most places, by stratified sandy material.

The reaction of the surface soil is in general medium acid and of the subsoil medium or strongly acid. Below a depth ranging from 10 to 12 feet, the reaction becomes less acid and in many places is slightly alkaline.

The surface relief ranges from nearly level to gently undulating. Most of the land is well drained, although a few areas, especially on the low-lying terraces, have somewhat deficient drainage in spots.

Most of this soil occurs in small scattered areas, principally in Kickapoo and Sugar Creek Valleys. Two of the largest areas are one-half mile west of the village of Barnum in Kickapoo Valley and in the lower part of Taintor Creek Valley, a tributary of Kickapoo Valley.

About 95 percent of the land is tilled (pl. 2, *B*). This is one of the most desirable agricultural soils of the county. Corn and mixed timothy and clover hay are the principal crops, some small grain is grown, and tobacco is commonly grown in Sugar Creek Valley. Only a very small proportion of the land is devoted to grazing, because those farms including Bertrand silt loam also include other soils that are better adapted to grazing than to tillage, whereas Bertrand silt loam is well adapted to tilled crops.

Crop yields are comparatively high. Corn yields from 50 to 70 bushels an acre; mixed timothy and clover, from 2 to 3 tons; alfalfa, from 3 to 4 tons; and tobacco, from 1,300 to 1,800 pounds.

Bertrand silt loam, rolling phase.—Bertrand silt loam, rolling phase, differs from Bertrand silt loam in that it has rolling rather than nearly level surface relief, but the soil characteristics are similar to those of typical Bertrand silt loam.

Practically all this soil occurs on the high benches, or terraces, along Wisconsin River, in the vicinities of Bridgeport, Wauzeka, and Boydtown. Owing to its more rolling surface relief, this soil is more susceptible to erosion than typical Bertrand silt loam, and the steeper areas are more difficult to till.

Bertrand silt loam, rolling phase, is a productive soil and is well adapted to general farming. Corn, small grains (principally oats), and mixed timothy and clover hay are the main crops grown, and some of the more rolling land is grazed. Where good farming methods are practiced, this soil yields from 45 to 70 bushels of corn an acre, from 40 to 65 bushels of oats, and from 2 to 3 tons of timothy and clover hay.

Bertrand silt loam, heavy-subsoil phase.—Bertrand silt loam, heavy-subsoil phase, is characterized by a light grayish-brown surface soil and a mottled clay subsoil. The 5-inch surface layer consists of light grayish-brown heavy silt loam. It is underlain, to a depth of about 16 inches, by mottled brown and gray silty clay loam. Below this depth, the material is mottled gray, yellow, and pinkish-brown clay. The reaction of the surface soil is slightly acid or medium acid and of the subsoil is medium acid or strongly acid.

The surface relief of this soil is nearly level, and this, in addition to the heavy impervious subsoil, results in deficient drainage of most areas, and thereby hinders the production of some crops.

Most of this soil occurs in Marietta Valley, Copper Creek Valley, and east of Bridgeport.

More than 90 percent of the land is tilled. Corn and hay are the principal crops grown, and a small acreage is devoted to small grains (oats and barley) on most of the farms where this is the predominant tillable soil. Crop yields differ widely, the most unsatisfactory yields are obtained on areas where drainage is most deficient and where the clay subsoil lies at a slight depth. Hay (mixed timothy and clover) yields from 1 to 2½ tons an acre and corn from 30 to 40 bushels. Alfalfa and tobacco are not grown to a great extent.

Waukesha silt loam.—The surface layer of Waukesha silt loam, to a depth ranging from 14 to 18 inches, is very dark brown smooth friable silt loam. Below this depth, and extending to a depth of about 24 inches, the material is dark-brown silty clay loam. The soil material below this layer becomes lighter brown or buff

soft silt loam, and, at a depth of about 40 inches, the color is mottled yellow, brown, and gray. The areas of this soil in the vicinity of Prairie du Chien are underlain by stratified sand at a depth ranging from 40 to 60 inches.

The reaction of the surface soil of Waukesha silt loam ranges from slightly acid to medium acid; of the subsoil, from medium acid to strongly acid; and the material at a depth of 12 feet or deeper is generally neutral or alkaline.

The surface relief of Waukesha silt loam is nearly level or gently undulating. The few depressions that occur have somewhat deficient drainage, but, with the exception of such bodies, the land is well drained. Parts of the areas in Citron and Haney Valleys are poorly drained. These poorly drained bodies occur on the parts of the terraces farthest from the surface drains or from the edge of the terrace area.

The largest areas of Waukesha silt loam are on the Prairie du Chien, in Haney Valley, and in Citron Valley, and a few small bodies lie in Kickapoo Valley.

Waukesha silt loam is one of the best soils in the county, and probably 95 percent of it is tilled. It is devoted mostly to corn, hay, tobacco, tomatoes, and a small quantity of small grains. Very little of the land is grazed, as it is too valuable for crop production to be used for pasture, especially where less arable soils are available for grazing. Because of its high fertility and smooth surface relief, it is greatly preferred for cultivated crops.

Corn yields from 45 to 70 bushels an acre, wheat from 20 to 30 bushels, tobacco from 1,300 to 1,700 pounds, and mixed timothy and clover hay from 2 to 3 tons. When this soil is properly limed, the well-drained areas produce abundant crops of alfalfa. Tomatoes are grown on this soil in the vicinity of Prairie du Chien, and yields average about 10 tons an acre.

SANDY SOILS

The group of sandy soils includes those soils of the upland and terraces that have brown or very dark brown distinctly sandy surface soils and yellow sand or fine sand subsoils. The reaction of these soils in both the surface soils and subsoils ranges from medium acid to strongly acid. These soils are lower in fertility than the heavier textured soils and are distinctly more droughty during periods of low precipitation and hot weather.

Boone fine sand.—Boone fine sand has a light-brown fine sand surface soil and a yellowish-brown fine sand subsoil. The 5- or 6-inch surface layer is brown fine sand, below which, and extending to a depth of about 20 inches, the material is yellowish-brown fine sand. Below this depth the color fades to yellow, and below a depth of about 40 inches, narrow strips or bands of partly cemented rust-brown sandy material occur through the yellow sand.

The surface relief of this soil ranges from undulating to rolling or steep. The narrow strips that occur below the steep slopes of rough broken land are steep, but the more extensive areas, as in sections 31 and 36, southwest of Soldiers Grove, have an undulating or gently rolling relief.

Most of this soil is in the northern half of Kickapoo Valley, and a few small bodies occur in some of the other stream valleys.

About 60 percent of the land is tilled, and the rest is grazed or is left fallow. Corn, rye, and a small quantity of oats and hay are grown. Cucumbers, melons, and buckwheat are grown to some extent. Acre yields of corn range from 20 to 35 bushels, oats from 20 to 25 bushels, and rye and buckwheat about 16 bushels. When properly fertilized and cared for, cucumbers and melons yield well.

Bertrand fine sandy loam.—Bertrand fine sandy loam is characterized by a brown fine sandy loam surface soil and a brown slightly heavier textured subsoil. The 6-inch surface layer consists of brown fine sandy loam, below which, and extending to a depth of 18 inches, the material is yellowish-brown heavier textured fine sandy loam. This material, in turn, is underlain by yellow sand or fine sand.

The reaction of both the surface soil and subsoil is medium acid or strongly acid. The stratified sand that underlies Bertrand fine sandy loam along Mississippi River is alkaline below a depth of 10 feet.

The surface relief is nearly level or gently undulating. Those areas lying at an elevation of 10 feet or higher above the adjoining first-bottom land are well drained, but a few areas that lie only a little above the adjoining first-bottom land are partly or wholly imperfectly drained.

This soil occurs in small areas, most of which are in Kickapoo Valley, but a few are scattered along the Wisconsin and Mississippi Valleys.

Practically 90 percent of the land is tilled, and only a small acreage is grazed. Corn, hay (mixed timothy and clover), and small grains are the important crops grown. Where the fertility of the land is maintained, good yields are obtained. Corn, under the usual system of farming, yields from 35 to 50 bushels an acre, hay from 1 to 2 tons, and oats from 35 to 45 bushels. Because of its smooth surface relief, limited area, and fair or good fertility, cultivated crops occupy a comparatively large proportion of this soil.

O'Neill sandy loam.—The surface material of O'Neill sandy loam, to a depth ranging from 10 to 18 inches, is very dark brown sandy loam. Below this depth, and extending to a depth of about 27 inches, the material is lighter brown sandy loam. Below the second layer the soil material grades into light-brown or yellow sand. The reaction of the surface soil and subsoil layers ranges from medium to strongly acid.

The surface relief of O'Neill sandy loam and O'Neill fine sandy loam is nearly level or gently undulating. Some bodies of these two soils occur as depressions between low ridges or undulations of sandier terrace soils, but even in such places the sandy subsoils afford suitable drainage to make the areas perfectly arable.

Practically all this soil occurs on the Prairie du Chien. It is devoted extensively to cultivated crops, principally corn and tomatoes. Corn yields from 35 to 50 bushels an acre, and acre yields of tomatoes probably average a little less than on Waukesha silt loam. Small quantities of mixed timothy and clover hay and small grains are grown on this soil.

O'Neill fine sandy loam.—O'Neill fine sandy loam is characterized by its very dark brown fine sandy loam surface soil and brown

sandy subsoil. The 20-inch surface layer is very dark brown fine sandy loam, below which, and continuing to a depth of about 35 inches, the material is brown fine sandy loam. This is underlain by yellow fine sand.

The reaction of the surface soil and subsoil layers ranges from medium to strongly acid. The utilization of this soil is similar to that of O'Neill sandy loam.

O'Neill loamy sand.—The 20-inch surface layer of O'Neill loamy sand is very dark brown loamy sand or loamy fine sand. Below this layer the soil material is brown gravelly loamy sand, and at a depth of about 28 inches it becomes brownish-yellow gravelly sand. The reaction of both surface soil and subsoil is medium acid or strongly acid.

The surface relief is gently undulating. The soil occurs in fairly extensive areas and also as low ridges or swells between lower strips of heavier textured O'Neill and Waukesha soils. Natural drainage is excessive, owing to the sandy character of the subsoil.

Practically all this soil occurs on the Prairie du Chien. It is devoted largely to rye, corn, and, to a small extent, to hay and buckwheat. Part of the land lies fallow, although practically all of it is cropped at some time. Crop yields are comparatively low, although the well-farmed areas produce yields of corn ranging from 35 to 40 bushels an acre. The average acre yield of corn is about 25 bushels, and rye yields from 15 to 20 bushels.

Sparta loamy fine sand, brown phase.—Sparta loamy fine sand, brown phase, has a brown loamy fine sand surface soil and a yellowish-brown fine sand subsoil. The 4-inch surface layer is dark-brown loamy fine sand. It is underlain by brown loamy fine sand which, below a depth of about 14 inches, is underlain, in turn, by yellowish-brown fine sand. At a depth of 30 or more inches, 2- or 3-inch strips or bands of dark reddish-brown partly cemented material occur in the yellow fine sand subsoil. The reaction throughout the entire soil profile ranges from medium to strongly acid.

The surface relief is nearly level or gently undulating. The lower parts, or depressions, have darker colored surface soils than do the intervening swells, but none of the lower spots is poorly drained. The soil, as a whole, is excessively drained.

About 95 percent of this soil is in the upper half of the Kickapoo Valley and on the Prairie du Chien, and a few scattered bodies are on other terrace formations.

About 75 percent of Sparta loamy fine sand, brown phase, is tilled, and the rest furnishes some pasture. Corn, rye, buckwheat, cucumbers, and melons are grown. Where the soil is well farmed, corn yields from 20 to 40 bushels an acre and rye from 10 to 20 bushels. Cucumbers and melons are successfully grown where the soil is well fertilized and not too excessively drained. All crops are adversely affected by protracted dry periods during the growing season.

FIRST-BOTTOM SOILS

The first-bottom soils occupy the flood plains of the streams. The water table is comparatively high, and the soils are, as a whole, deficiently drained. About 90 percent of the area of these soils is

subject to stream overflow. The reaction ranges from neutral or slightly alkaline to medium acid.

Ray silt loam.—Ray silt loam is characterized by its light-colored surface soil and its contrasting, nearly black, subsoil. The surface soil, which extends to a depth ranging from 6 to 18 inches, is light grayish-brown silt loam, and in many places near the stream banks it is fine sandy loam. The subsoil is very dark brown or nearly black silt loam which, at a depth of about 22 inches, becomes lighter brown or mottled brown, gray, and yellow. The texture in this layer ranges in different locations from silt loam to fine sand. The reaction of Ray silt loam ranges from neutral to medium acid.

The surface relief of this soil is nearly level or but slightly hummocky. Drainage ranges from poor to fair, and the water table lies from 2½ to 7 feet below the surface.

This soil occupies the greater part of the stream-bottom land throughout the interior of the county, including the bottom land along Kickapoo River. About 85 percent of the land is subject to stream overflow, and approximately 50 percent is available for limited tillage. Most of that part not available for tillage is timbered and is used for pasture. That part available for limited tillage, that is, the part which is sufficiently well drained to produce crops, is devoted largely to grazing and the production of corn and hay. Bluegrass and white clover furnish abundant pasture, and corn yields from 45 to 70 bushels an acre. Where Ray silt loam occurs on farms having only a small amount of other land available for cultivated crops it may be cropped to corn continuously for several years. In some sections the best drained areas are devoted to tobacco growing, and yields approximate those produced on Waukesha silt loam. Mixed timothy and alsike clover are well adapted to this soil. On the best drained areas, mixed medium-red clover and timothy produce yields equivalent to the best yields obtained on the upland soils. Alfalfa has yielded well on a few of the best drained areas.

Ray fine sandy loam.—The surface soil of Ray fine sandy loam, to a depth ranging from 16 to 36 inches, is light-brown fine sandy loam. Below this layer and extending to a depth of about 48 inches the material is very dark brown loam or silt loam. The material underlying this layer is variable in both color and texture, but it is everywhere lighter colored than that in the layer above and is generally sandy. The reaction of this soil ranges from neutral to medium acid.

Ray fine sandy loam is much less extensive than Ray silt loam. It occurs throughout the county on the first bottoms of many of the streams.

Ray fine sandy loam, as a whole, is better drained than Ray silt loam. The less accessible areas are devoted to grazing, and the more available and better drained areas are devoted extensively to crop production. Bluegrass furnishes good grazing, but it frequently dries out during dry weather in places where the water table is from 4 to 5 feet below the surface. The tilled areas are devoted largely to corn, potatoes, and tobacco. As with Ray silt loam, where little land on a farm other than Ray fine sandy loam is available for cultivated crops, this soil is devoted to the continuous production of such crops. Timothy and clover (alsike or medium red) are grown

to some extent, and they produce good yields of mixed hay on the better drained areas. Crop yields, although they do not average so high as those obtained on Ray silt loam, are good.

Wabash silt loam.—Wabash silt loam has a nearly black surface soil and a dark-colored subsoil. The surface layer, to a depth of about 25 inches, is very dark brown silt loam, and below this depth the material is dark brown mottled with yellow and dull gray. Below a depth of 40 inches, the material is mottled dull grayish-brown or mottled yellow sand or rock debris. The reaction of this soil ranges from neutral to medium acid. The surface relief is nearly level, and many bodies occupy depressions within larger areas of Ray silt loam or Ray fine sandy loam.

This soil is widely distributed over the county, but most of it occurs in small isolated areas. Only a small proportion of the land is tilled, as most of it is too poorly drained to allow cultivation. Probably 85 percent of the land is in pasture, and grazing ranges from fair to good, except on the wettest areas. The sedge grass that grows on the poorly drained areas makes poor grazing. The fairly well drained areas produce good crops of corn and alsike and timothy hay. Tobacco has produced very good yields on one or two areas. Practically all the land is subject to stream overflow.

Wabash fine sandy loam.—Wabash fine sandy loam, to a depth of about 20 inches, consists of very dark brown fine sandy loam, and the material below this layer is brown fine sandy loam. Below a depth of 40 inches, the material is variable, in most places being a mixture of sandy material and rock debris. The reaction of this soil ranges from neutral to medium acid.

The areas of Wabash fine sandy loam are nearly level, and drainage is generally deficient. Most of this soil occurs along small drainageways.

The bodies of this soil are comparatively small and scattered. A small proportion of the land is cultivated. Where fairly well drained, it produces good yields of corn, hay, tobacco, and potatoes. Most of it is devoted to pasture, to which purpose the soil is well adapted.

Alluvial soils, undifferentiated.—Alluvial soils, undifferentiated, include all the first-bottom land along Mississippi and Wisconsin Rivers, which has not been cleared and cultivated. The cultivated areas are classified in the Ray and Wabash soil series. Practically all these extensive unclassified areas are too poorly drained for cultivation, and most of them are timbered. A large part of such land is grazed, but its use as pasture land is limited by the dense growth of trees and brush and because much of it is too wet to produce palatable grasses.

The reaction of these undifferentiated alluvial soils ranges from neutral to strongly acid.

MISCELLANEOUS SOIL MATERIAL

Rough broken land.—Rough broken land includes all those areas that are too steep, stony, or broken to allow the soil to be tilled to advantage. Most of the slopes have a gradient of more than 30 percent and have practically no agricultural value other than for timber growing and scant grazing. Rough broken land is mapped

throughout the upland part of the county. It is most extensive along the western edge, where the relief is greatest, and in the immediate vicinity of Kickapoo Valley. Probably 90 percent of the rough broken slopes is timbered with second-growth white oak, black oak, poplar, basswood, and maple.

About 90 percent of this land is pastured. The northward-facing slopes are more productive, both for timber and grass, than the southward-facing slopes, although the southward-facing slopes are advantageous, in that they afford grazing 10 or 12 days earlier in the spring than does other grazing land.

AGRICULTURAL METHODS AND MANAGEMENT

The farmers of Crawford County follow a general system of crop rotation that is changed to suit the different conditions sure to exist where the soil and surface slope differ as they do in this county.

On areas of the ridge-land soils smooth enough to make possible the growing of corn once every 4 or 5 years without causing heavy soil losses by erosion, a 3- to 5-year rotation is practiced, including 1 year of corn, followed by 1 or 2 years of small grains which, in turn, are followed by a hay crop, generally mixed timothy and medium red clover. The hay crop is seeded with the small-grain crop, and ordinarily it is retained for 2 years, on many farms for 3 or 4 years. The length of time that this crop is retained depends on the amount of clover remaining in the stand from year to year and on the success in obtaining new seedings in other fields. When alfalfa is grown, it is cut for hay as long as the stand justifies. Some well-cared-for alfalfa fields have been producing well for 9 or 10 years.

On areas of ridge-land soils too sloping for the production of cultivated crops, a two-crop rotation is generally followed, small grain being grown for about 2 years, followed by hay for 2 or more years.

The system of rotating crops on the valley soils allows for a greater acreage of corn. On these soils, corn is generally grown for 2 or 3 years and is followed by hay for 2 or more years. Only a small acreage of these soils is devoted to small grains. Alfalfa is a common crop on the silt loam and loam soils of the valleys, and this crop is retained on the same ground from year to year, as long as it yields well. When it is killed out or is run out by other grasses, it is plowed under and the land again planted to corn.

Tilled areas of the Ray and Wabash soils are not generally farmed in rotation, the most desirable tillable areas being planted to corn and tobacco for several years in succession. Mixed timothy and clover hay is the most common crop grown on the less accessible tillable areas, and on some farms hay is regularly rotated with cultivated crops.

The crop rotation to be used on most of the soils of Crawford County should be planned to emphasize the growing of legume-hay crops and to avoid an excessive acreage of cultivated and cash crops. Leguminous-hay crops, especially clovers and alfalfa, help to build up the nitrogen supply of the soil and to prevent erosion, whereas cultivated crops have a tendency to reduce the fertility of the soil and allow erosion to progress.

Manure, although not so judiciously conserved as it should be, is recognized as an important element in the maintenance of soil fertility. Most of it is applied for the benefit of the cultivated crops, especially those grown as cash crops. A small part is used as a top dressing on new hay seedings and on alfalfa meadows, but it is not commonly applied on fields to be sown to small grain.

Barnyard manure is the cheapest and best fertilizer available to the livestock farmers. Storage facilities should be such as to protect the manure from being leached or washed away by rain water. It should not be allowed to accumulate in piles for a year or more, before being applied to the fields. Cleaning of the yards twice each year (spring and early fall) is a well-recommended practice. For general-farm crops (corn and hay), manure should be spread evenly and not excessively thick. It is considered better practice to cover 10 acres with a medium application of manure than to cover 7 acres with a heavy application.

The use of commercial fertilizers and lime has increased rapidly during the last decade. Commercial fertilizer is now being used extensively on the land devoted to cash crops. About 60 tons of nitrate fertilizer were used on the Gays Mills apple orchards in 1930. Tobacco growers commonly use commercial fertilizer as a supplement to barnyard manure. Most of the fertilizer used for tobacco is high in phosphorus and potash, and it is applied at the rate of about 300 pounds an acre. For tomatoes, a 2–12–2 [2] fertilizer is recommended and used. Tomatoes grown on the heavy-textured Waukesha soil receive between 200 and 300 pounds of fertilizer an acre, but on less fertile soils heavier applications are advisable. Other cash crops that are frequently fertilized with commercial fertilizer are cabbage, cucumbers, and melons.

Of the general-farm crops, corn receives most of the commercial fertilizer used, most of which is drilled in at the time of planting, at the rate of about 125 pounds an acre. A 4–8–6 mixture is the most commonly used and recommended commercial fertilizer. A small quantity of commercial fertilizer is broadcast with small grain, at the rate of about 300 pounds an acre.

Commercial fertilizer and lime should be used on practically all the farms. Soil tests and the experience of the farmers have shown that most of the soils, especially the ridge-land soils, are deficient in lime and respond well to an acre application of 2½ or 3 tons of ground limestone when alfalfa is grown. When the ground is properly prepared for alfalfa, especially limed, this crop is recommended to be grown on ridge-land soils which are too steep for frequent cultivation but, nevertheless, are available for hay crops. Alfalfa, where well established on these steep slopes, will yield a profitable annual crop and avoid the hazard of frequently plowing the field, which exposes it to destructive erosion.

Of the three fertilizer elements—nitrogen, phosphorus, and potassium—phosphorus is the first to consider in buying commercial fertilizer for general farm use. It is true that the nitrogen supply of most of the soils is comparatively low, but this element can be supplied more economically by making good use of all available manure and maintaining a large acreage of leguminous-hay crops, whereas

[2] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

phosphorus cannot be returned to the soil through the growth of legumes. According to the county agricultural agent, 100 samples of poorly producing soils showed that they contained an average of only 35 pounds of available phosphorus an acre. The soils department of the College of Agriculture of the University of Wisconsin advises that a productive soil in this section should receive at least 100 pounds of available phosphorus an acre for the growth of a good corn crop. To remedy this deficiency, the use of high-phosphate fertilizer as a supplement to barnyard manure is recommended. One of the most effective methods by which to accomplish this is to apply from 250 to 300 pounds of high-phosphate fertilizer, such as 2–12–2, 2–8–6, or superphosphate (0–12–0), at the time the ground is being prepared for the small-grain crop and grass seeding.

Soil erosion is one of the most serious problems that Crawford County farmers face. Only a very few square miles of tillable soils in the county are not endangered by removal of the soil material and development of gullies by run-off water. Much of the surface soil has been removed from many fields, leaving the less productive subsoil and, in some places, stony sterile clay exposed for cultivation. In other fields, gullies have developed to a size that greatly depreciates the value and use of the fields. Soil losses from erosion can be greatly checked, either by altering the surface drainage in such a way as to cause the run-off water to move more slowly and thus carry less soil material, or by adopting a cropping system that calls for a minimum of cultivation and plowing.

The soils department of the College of Agriculture has constructed Mangum terraces on several fields throughout the county, as active demonstrations of the value of terracing to prevent surface erosion. These terraces are low ridges thrown up by a grader on the slopes in such a way as to deliver the run-off water from the field without allowing it to flow fast enough to carry much soil material. The ridges are low and smooth enough to allow the unhampered use of all ordinary farm machinery on the fields. By a little attention, the terraces can be maintained effectively for an indefinite number of years.

Care as to the crops grown and the amount and frequency of plowing and cultivating will do much to prevent serious erosion. The growing of cultivated crops should be restricted on those areas most subject to erosion. Even on some of the areas where erosion does not appear to be active during growth of the first cultivated crop following the breaking of the meadow sod, it frequently becomes very active if a cultivated crop is grown the second year. If conservation of the soil material is to be considered, cultivated crops should seldom, if ever, be grown where the slope of the ground is as much as 14 percent. The frequently practiced system of growing small grain and hay on the steep slopes is strongly recommended. Alfalfa is a good crop to establish on hillsides, because of its ability to produce good yields for several years in succession after it is well established, also because it is a splendid conserver of the soil.[3]

[3] Experiments carried out at some of the soil-erosion experiment stations have shown that crops like grass, sweetclover, and alfalfa greatly reduce the run-off and in some instances reduce erosion more than a hundred times, as compared with clean-tilled crops on the same soil occupying the same slope and receiving the same amount of rainfall

The necessity of getting the soil in a fairly good state of fertility before seeding alfalfa should not be overlooked, as failure of the crop means that the soil must be tilled again.

The practice of laying out the fields in parallel strips at right angles to the slope is successfully practiced by a few farmers. Thus, if a part of the slope is plowed and the other part is in meadow, the meadow prevents, rather than augments, concentration of the run-off water and the consequent development of ditches to considerable extent. This is in reality a form of strip cropping.[4]

In many places, deep gullies are developing and have lowered the value of many acres of land. Many of these gullies have developed because the natural surface drainageways have been plowed, thus making it easy for the run-off water to develop gullies, owing to the easy removal of the loosened soil by erosional water. When such fields are plowed the surface drains should be left well sodded at all times. Where gullies have already developed, it is possible to arrest their further growth and eventually fill them by constructing soil-saving dams in them, by building diversion embankments to carry the water into the channels at noneroding points, and by planting willows, shrubbery, sweetclover, grass, or other soil-saving plants at critical places. The soils department of the College of Agriculture has built several of these dams throughout the county to demonstrate the control of gully erosion.

SOILS AND THEIR INTERPRETATION

Crawford County lies in the driftless area of southwestern Wisconsin. The underlying rock formations, from the top down in order, are the Galena-Trenton limestones, St. Peters sandstone, lower magnesian limestone, and Potsdam sandstone. All the Dubuque silt loam and most of the Clinton and Tama silt loams, and their steep phases, are underlain by the limestone formations, although a few areas of Clinton silt loam are partly underlain by St. Peters sandstone. The Boone soils are underlain by the sandstone formations.

On the basis of soil development, this county lies almost wholly in the gray-brown podzolic soil region, with outliers of the humid prairies represented by the Tama, Bates, Waukesha, and O'Neill soils, all of which are of small extent. As indicated by the temperature and precipitation data, Crawford County has a climate typical of these two broad groups of soils. The average annual rainfall is nearly 31 inches, the mean annual temperature is 47° F., and the frost-free period ranges from 125 to 167 days. The gray-brown soils of the county have, or did have previous to settlement, a dense, mature growth of oak and hickory, with maple and basswood east of Kickapoo River. The Tama, Bates, O'Neill, and Waukesha soils very evidently supported a grass vegetation, although early settlers in Vernon County (which joins Crawford County on the north) state that scattered sapling trees grew in places on the prairie areas.

Owing to the amount of rainfall in this region, and to the age and character of the soil materials, leaching of the soluble salts has

[4] GEIB, H. V. STRIP CROPPING TO PREVENT EROSION. U. S. Dept. Agr. Leaflet 85, 6 pp., illus. 1931.

progressed to a marked degree. Neutral or alkaline reactions are obtained on the well-developed terrace soils and on some of the upland soils, at a depth ranging from 10 to 12 feet.

The soils belonging to the gray-brown podzolic soils group are the Clinton, Dubuque, and Boone soils of the uplands and the Bertrand soils of the terraces. The soils belonging to the humid prairie soil group are the Tama and Bates soils of the uplands, and the Waukesha and O'Neill soils of the terraces. The distinguishing features of the gray-brown podzolic soils are deciduous hardwood vegetation (white oak, black oak, maple, basswood, hickory); low content of organic matter throughout the soil profile, except in the surface inch or two; an acid reaction and marked absence of soluble salts throughout the principal layers of the soil profile; and an accumulation of iron and aluminum oxides at a depth of about 20 inches. The outstanding characteristics of the humid prairie soils developed under a grass or prairie vegetation are a high content of organic matter and dark color to a depth of about 12 inches; an acid reaction and marked absence of soluble salts throughout the principal layers of the solum; and a relative accumulation of iron and aluminum oxides at a depth of about 20 inches, which is, however, less marked than in the gray-brown soils.

A typical profile of the gray-brown soils is that of Clinton silt loam. Following is a description of a profile of this soil, as observed in an area of virgin oak forest on Dutch Ridge near the middle of sec. 36, T. 8 N., R. 6 W.:

0 to 2 inches, a mixture of leaf mold, other partly disintegrated organic material, and some mineral matter, matted or bound together by a network of grass and tree rootlets. The immediate surface soil is dark brown, but the lower part of the layer is very dark brown or nearly black, is more disintegrated, contains a greater quantity of mineral material, and is somewhat granular The reaction of the material in this layer is slightly acid or medium acid. Under cultivation, the color effect of this layer can be perceived for the first year or two, but it rapidly disappears under further tillage and cropping

2 to 3 inches, the material is dark grayish-brown soft friable silt loam that crumbles to small soft soil particles. This layer contains numerous small roots, but the matted condition existing in the surface layer is entirely absent.

3 to 11 inches, light grayish-brown soft silt loam which breaks easily to slightly firm subangular irregularly flattened fragments. Close examination of a clod of the material in this layer shows that the fine soil aggregates, or fragments, lie in a horizontal position, and when a clod is broken horizontally, the mass separates into rough laminations, or planes, but when broken vertically the breakage surface is rough or more jagged Although the mass color of this layer appears light grayish brown, close examination reveals that the color distribution is not uniform The body of a soil aggregate is pale yellowish brown or dull brown, but the outer part, or surface, is covered by an irregular coating or film of whitish-gray material. The soil mass is somewhat honeycombed, or vesicular, and contains a few rootlets and rootlet holes. The reaction of the material in this layer ranges from medium acid to strongly acid.

11 to 14 inches, the gradation from the second layer to the third layer is rather abrupt, but the gradation from the third layer (which is the typically eluviated layer) to the fourth layer is a true gradation that extends through a thickness of 4 or 5 inches. This gradational layer becomes heavier textured and darker brown with depth

14 to 24 inches, deep-brown silty clay loam that breaks readily to subangular fragments ranging from one-eighth to one-half inch in diameter. The fragments are definite in shape and offer some resistance

to pressure. They have an irregular whitish-gray film or coating on their surfaces. The material is much less vesicular and contains fewer rootlets than that in the overlying layer. The reaction of the soil material in this layer is strongly acid.

24 to 50 inches, the material grades to a lighter color and a more silty texture. The main mass of this layer is buff or yellowish-brown heavy silt loam that breaks into definite subangular fragments from one-third inch to 1½ inches in diameter. The fragments are less resistant to pressure than those of the layer above The reaction of the material in this layer is strongly acid.

Below a depth of 50 inches, the soil material becomes mottled yellowish-brown, yellow, and gray smooth silt loam which, under pressure, breaks into angular blocks, and under heavy direct pressure, the mass breaks to a nearly single-grain mass The reaction at a depth ranging from 70 to 80 inches is, in most places, medium acid or slightly acid. Bedrock of limestone or sandstone lies at a depth ranging from 45 to 120 or more inches.

The deep phase of Dubuque silt loam differs from Clinton silt loam primarily in having a slighter depth to bedrock, and it is, practically, a shallow phase of Clinton silt loam. Heavy clay, cherty material, or sandy clayey material is reached at a depth ranging from 24 to 40 inches. Most of the deep phase of Dubuque silt loam overlies limestone, although in a few areas the limestone seems to have entirely decomposed and the soil material overlies sandstone, with a remnant of clay between the soil and the bedrock. The reaction of the various layers of this soil is identical with that of the corresponding layers of Clinton silt loam.

Dubuque silt loam is a shallow silt loam. The surface soil, to a depth of about 8 inches, is similar to that of Clinton silt loam, except that in a few areas the surface soil is brown or dark brown. These areas, however, are exceptions, and most of them occur on narrow exposed ridge ends. Below a depth of 8 or 10 inches, there is, in most places, though not everywhere, an illuviated layer 6 or 8 inches thick. This layer consists of yellowish-brown silty clay loam that breaks readily to firm subangular fragments. The reaction of the material in this layer ranges from medium acid to strongly acid. At a depth of about 16 inches, residual cherty reddish-brown clay that breaks readily to definite angular fragments is present. This clay layer, in some places where it overlies Galena-Trenton limestone, is yellow or greenish yellow. When subjected to pressure while in a moist condition, the fragments crush together into a stiff plastic mass, and when dried they have a brick-like hardness. Limestone or an impenetrable mass of chert is present in most places at a depth of about 28 inches. Dubuque silt loam that occurs on the Galena-Trenton limestone is almost chert free, whereas most of Dubuque silt loam overlying lower magnesian limestone contains a varying quantity of chert. The soil throughout the entire profile ranges from medium to strongly acid, and the reddish-brown clay is strongly or very strongly acid.

The upper layers of Boone silt loam are similar to those of the Clinton and Dubuque soils. At a depth ranging from 22 to 45 inches, sandy or shaly material is reached, and, in some places, a yellowish-brown sandy clay layer occurs just above the disintegrated rock material. This soil is everywhere underlain by sandstone or shale. The reaction of all the layers of Boone silt loam ranges from medium to strongly acid.

The valley soils, Boone silt loam, valley phase, Boone loam, Boone fine sandy loam, and Clinton silt loam, valley phase, have three common characteristics as follows: The surface soils are noticeably darker than the surface soils of the ridge-land soils, their profiles show the effect of colluvial action, and the soil material is distinctly less acid than that of the ridge-land soils.

A description of a typical profile of Boone fine sandy loam, as observed 1 mile northwest of Steuben, is as follows:

0 to 4 inches, dark-brown or very dark brown fine sandy loam that falls apart easily to a nearly single grain mass. Sandstone fragments, that have worked down from the rough broken land above, are strewn over the surface. The reaction of the material in this layer is neutral or slightly alkaline.

4 to 10 inches, brown fine sandy loam that breaks to weak-structured fragments which are easily broken down The color grades from dark brown to lighter brown from the top downward A few sandstone fragments occur in this layer The reaction is neutral

10 to 20 inches, the material is yellowish brown in color, otherwise it is similar to the material in the layer above.

20 to 40 inches, a layer of buff silt loam containing a noticeable quantity of grit or sand. The material breaks readily to definite subangular fragments, from one-twelfth to three-fourths inch in diameter, which are very resistant to pressure when dry. The reaction of the material in this layer ranges from medium to strongly acid.

40 inches +, yellowish-brown sand or fragments of sandstone or shale The reaction of this material is medium acid.

Boone loam and the valley phase of Boone silt loam differ from the above description mainly in that they have loam and silt loam surface soils, respectively. In places where only 3 or 4 inches of the surface layer have a loam texture and the soil throughout the rest of the profile is silt loam, the soil is included with the silt loam type.

The valley phase of Clinton silt loam differs from Boone fine sandy loam in that the surface soil is silt loam and the subsoil below a depth of 40 inches is friable buff silt loam rather than sand or stony material. This silty material, in places where it extends to a depth ranging from 10 to 12 feet, is generally neutral or alkaline in reaction in the lower part. Included in the valley phase of Clinton silt loam, north of Bridgeport, are a few areas that are less colluvial in character, as they do not lie immediately below steep slopes of rough broken land, and as a consequence only a few rock fragments occur in the soil mass and the surface soil is that of typical Clinton silt loam.

Boone fine sand, which is a valley soil associated with Boone loam and Boone fine sandy loam, has a lighter colored surface soil and is fine sand throughout the profile. In most places it does not have characteristics indicative of colluvial accumulation. The surface soil, to a depth of 5 inches, is brown fine sand, and below this layer the material is yellowish-brown or yellow fine sand. Below a depth of 40 inches, narrow bands, or layers, of partly cemented rust-brown loamy fine sand occur in the yellow sand. The surface relief of Boone fine sand ranges from undulating to steep, whereas the relief of the other valley soils ranges from sloping to steep. The areas of the other valley soils occur mostly as narrow steep slopes below steep slopes of rough broken land, whereas most areas of Boone fine sand are more extensive.

The two upland soils representing the humid prairie soils are Tama silt loam and Bates silt loam. Tama silt loam occurs on the

ridge land and is associated with the Dubuque and Clinton soils. Bates silt loam is a valley soil associated with the valley phase of Boone silt loam. A typical profile of Tama silt loam is described as follows:

0 to 3 inches, very dark brown smooth silt loam matted together with grass roots.

3 to 9 inches, very dark brown or nearly black smooth silt loam that crumbles readily to irregular but not angular soil clusters from one-sixteenth to one-fourth inch in diameter. This layer contains many grass rootlets.

9 to 16 inches, dark-brown smooth silt loam that breaks readily to irregular but not angular fragments.

16 to 38 inches, dull-brown silty clay loam that breaks readily to somewhat rounded but irregular soil clusters or fragments, from one-sixteenth to one-half inch in diameter, which are covered with an irregular whitish-gray coating.

38 to 48 inches, the material becomes slightly mottled with yellow, and the texture is somewhat more silty The soil mass tends to remain firm in place until forced apart, and under pressure it breaks into definite subangular chunks.

48 inches +, finely mottled yellow, yellowish-brown, gray, and dark-brown silt loam that remains in chunks until forced apart.

The soil material of Tama silt loam ranges in thickness from 2 feet to 9 feet. It is underlain for the most part by limestone. The reaction of the material throughout the entire profile ranges from medium acid to strongly acid.

Included with mapped areas of this soil are a few areas that do not have a distinctly very dark brown surface soil. These areas seem to be, and their association with the Clinton and Tama soils indicate that they are, a gradation from one soil to the other.

Bates silt loam differs from Tama silt loam in that it occurs as narrow strips in the valleys immediately below the sloping areas of rough broken land; the surface soil in many places is variable in texture and structure, owing to colluvial action; the surface soil is uniformly darker and deeper; and the reaction ranges from neutral to medium acid. Bates silt loam is a valley soil and is associated with the valley phase of Boone silt loam.

The soils of the terraces may be divided into three groups—gray-brown podzolic soils, humid prairie soils, and semiprairie sand soils. The first group includes all the soils of the Bertrand series, the second group includes all those of the O'Neill and Waukesha series, and the third group includes Sparta loamy fine sand, brown phase.

The profile of Bertrand silt loam is similar to that of Clinton silt loam to a depth ranging from 8 to 14 feet. At this depth, the underlying strata of Bertrand silt loam is gravelly or sandy material, and in most places, at a depth ranging from 10 to 12 feet, the soil material has a neutral or alkaline reaction. A few areas of Bertrand silt loam in Sugar Creek Valley have a layer of reddish-brown clay at a depth of about 8 feet. Below this layer, which is about 2 feet thick, is stratified sandy material. Some of the Bertrand silt loam on the high bench, or terrace, in the vicinities of Bridgeport and Wauzeka, is underlain at a depth ranging from 6 to 12 feet by a limestone rock shelf, and here the sandy substrata are not so prominent below this part of the area. The substrata below some other parts of this bench are comprised of a mixture of chert and sandy material. Much of this high bench has been extensively dissected by erosion, giving these areas a gently rolling or rolling surface relief.

The heavy-subsoil phase of Bertrand silt loam is one-third as extensive as typical Bertrand silt loam. The surface soil is distinctly lighter brown or grayish-brown heavy silt loam or silty clay loam, and below a depth of about 5 inches, the material is mottled light gray and brown. At a depth of about 24 inches, reddish-brown, mottled with whitish gray, stiff plastic clay occurs. The mass falls apart readily to subangular fragments. Below a depth of 45 inches, the mass becomes highly mottled brick-red, gray, and yellow stiff plastic clay. The reaction of the material throughout the entire profile ranges from medium acid to strongly acid.

Bertrand fine sandy loam is distinctly more sandy than Bertrand silt loam. The only areas of Bertrand loam occur on the high terrace in the vicinity of Bridgeport. The surface relief of these areas is gently rolling or rolling. The surface soil to a depth of about 7 inches is light-brown loam, below which is a layer that grades into yellowish-brown gritty clay loam that crumbles or breaks readily to subangular fragments. At a depth of about 26 inches the material becomes yellowish-brown fine sandy loam that may or may not contain some gravel. The soil mass ranges from medium acid to strongly acid to a depth of approximately 12 feet, below which depth it is, in most places, neutral or alkaline.

The Waukesha soils are distinctly dark colored. About one-half of the total area of Waukesha silt loam, as mapped in Crawford County, has a deep silt subsoil, whereas the other half has a sand subsoil. These two soils were combined in mapping because of their similarity and the small extent of each. The deep silt loam subsoil areas occur mostly in Kickapoo Valley, and the sand subsoil areas are in the vicinity of Prairie du Chien, associated with the fine sandy loam, sandy loam, and loamy sand members of the O'Neill series.

Following is a description of a typical profile of Waukesha silt loam having a deep silt loam subsoil, as observed in the NE¼ sec. 6, T. 8 N., R. 4 W.:

0 to 12 inches, very dark brown friable soft silt loam The material crumbles or breaks readily into fine soft aggregates.

12 to 22 inches, brown silty clay loam that breaks readily to rather definite subangular fragments.

22 to 38 inches, buff silt loam that breaks readily to subangular fragments. The structure of these fragments is noticeably weaker than that of the fragments in the layer above.

38 inches +, nearly everywhere silt loam, the color of which is mottled yellow, gray, and brown. This material is friable but distinctly less so than the surface soil. The soil mass breaks apart only under pressure into angular blocks that hold their definite shape until forced apart.

Included in those areas of Waukesha silt loam that have a deep silt loam subsoil are poorly drained areas which occur on those parts of the terrace areas farthest away from the terrace breaks or drainage channels. In such places the mottled condition is evident within 10 or 12 inches of the surface.

The areas of Waukesha silt loam having a sand subsoil differ from typical Waukesha silt loam, as described above, in that the nearly black surface soil extends to a depth of approximately 20 inches, below which and extending to a depth of about 36 inches the material is dark-brown friable silt loam. Below a depth of 36 inches the material is brown fine sandy clay loam, and at a depth of 50 inches substrata of yellowish-brown sand grading into brownish-yellow sand

occur. The reaction of the soil included in Waukesha silt loam ranges from slightly acid to strongly acid.

O'Neill fine sandy loam, O'Neill sandy loam, and O'Neill loamy sand are closely related to and associated with the Waukesha silt loam having the sandy subsoil. The surface soil of O'Neill sandy loam is nearly black sandy loam. Below a depth of about 12 inches the material becomes brown or dark-brown brittle sandy loam, and at a depth of about 30 inches the color grades rapidly into lighter brown (yellowish brown), and the texture becomes sand or gravelly sand. The reaction ranges from slightly acid to strongly acid. O'Neill fine sandy loam is similar to O'Neill sandy loam, except that the texture of the surface soil and upper subsoil layer is fine sandy loam rather than sandy loam.

Although these two soils have a subsoil, lying at a depth of 20 inches, that is distinctly heavier than the surface soil, O'Neill loamy sand does not. Its surface soil has a loamy sand texture, and the color, though generally slightly lighter, is very dark brown and extends to a depth of about 18 inches. The subsoil below this depth is dark-brown gravelly loamy sand, and below a depth of about 27 inches the color is brownish yellow and the texture is gravelly sand.

Bands of hardpan material occur in places under the O'Neill soils, especially under O'Neill loamy sand, but they lie at a noticeably deeper level than under Sparta loamy fine sand, brown phase.

Stratified gravel underlies much of O'Neill fine sandy loam, sandy loam, and loamy sand, as well as Sparta loamy fine sand, brown phase, at a depth ranging from a few feet to 12 feet. This gravel has an alkaline reaction at a depth of 12 feet below the surface.

Sparta loamy fine sand, brown phase, is a brown sandy soil. The surface soil, to a depth of 4 inches, is a dark-brown loamy fine sand which contains a considerable amount of organic matter. Below this layer and extending to a depth of about 14 inches, the material is brown loamy fine sand which is slightly coherent but, nevertheless, weak structured. Below this layer, in turn, the material is light-brown fine sand that is compacted or very slightly cemented. At a depth of about 25 inches lies a 3-inch band, or layer, of brown firmly cemented loamy fine sand which breaks to a single-grain structure. Below this layer the material is light-brown fine sand, in places containing bands of brown cemented fine sand or loamy fine sand. The color of the loose sandy material may be somewhat variegated or mottled with lighter shades of brown and dull gray. The reaction of Sparta loamy fine sand, brown phase, ranges from medium acid to strongly acid. The underlying gravelly material is alkaline at a depth of about 12 feet.

Most of Sparta loamy fine sand, brown phase, lies along the southern edge of the Prairie du Chien terrace and in the upper part of Kickapoo Valley. Two small bodies occur along the western edge of the high terrace, or bench, north of Wisconsin River. These areas are very sandy and have a bumpy or choppy surface relief.

Before the settlement of the uplands of the county, all the first-bottom soils of the streams apparently had the characteristics of the Wabash soils. After tillage was started, much of the light-colored surface soil was washed from the uplands and deposited on the dark-colored bottom soils, and thus a different soil, classified in the Ray series, was formed.

The following description is typical of Ray silt loam, as observed in the SE¼ sec. 5, T. 8 N., R. 4 W.:

0 to 14 inches, light grayish-brown silt loam which is soft, crumbly, and distinctly laminated.
14 to 21 inches, nearly black silt loam containing a noticeable quantity of sand. The separation between these two layers is sharp and distinct.
21 to 32 inches, mottled dull-brown, very dark brown, and pale-yellow fine sand The texture of this layer in many places is silt loam.
32 inches +, mottled light-gray, gray, and brown loamy fine sand that grades into fine sand. In many places rock debris underlies this soil at a depth of 40 inches.

The reaction of Ray silt loam ranges from neutral to medium acid.

Ray silt loam is the predominant first-bottom soil of the county, excluding the first-bottom areas along Wisconsin and Mississippi Rivers mapped as alluvial soils, undifferentiated. It occurs along practically all the streams. Most bodies of this soil along the stream banks include small areas of Ray fine sandy loam.

Ray fine sandy loam differs from Ray silt loam in having a fine sandy loam surface soil which in many places extends to a depth of 36 inches. It is widely distributed, and many small areas are included with the heavier textured Ray silt loam. Because of their having been formed by recent deposition, these soils are, on the whole, better drained than the Wabash soils.

Following is a description of typical Wabash silt loam, as observed in the SW¼ sec. 29, T. 7 N., R. 5 W.:

0 to 20 inches, very dark brown silt loam mottled somewhat with a lighter shade of brown or rust brown. The material breaks into subangular chunks.
20 to 40 inches, material much the same in color as that in the layer above, but having a higher organic-matter content.
40 inches +, mottled rust-brown and dark-gray silt loam. This layer contains a few iron concretions.

The dark color of Wabash silt loam in few places extends to a depth of more than 28 inches, the lighter colored mottled silt loam occurring at and below this depth. The water table stands at a depth of about 36 inches at the point where the profile answering to the above description was observed. The reaction of this soil in most places ranges from slightly to medium acid.

Wabash fine sandy loam has a profile similar to that of Wabash silt loam, except that the texture of the surface soil is fine sandy loam. The texture of the subsoils of both of these soils, however, differs in different locations, ranging from fine sandy loam to heavy silt loam. The bodies of these two soils are small and scattered. They are distinctly more poorly drained than are the soils of the Ray series.

Alluvial soils, undifferentiated, include the unclassified poorly drained first-bottom soils of the Wisconsin and Mississippi River flood plains.

Rough broken land includes those areas too steep, stony, or rocky to be tilled, that occupy most of the valley slopes. The surface of most of the rough broken land has a thin covering of dark-brown soil material ranging in texture from fine sand to silt loam. In most places the soil material at the lower edge of these slopes is noticeably thicker and has a higher content of organic matter. Where part of the slope overlies limestone, the reaction of the soil material is alkaline or only slightly acid.

CLASSIFICATION OF LAND ACCORDING TO NATURAL PRODUCTIVITY

In order to give the reader some idea of the relative usefulness for crops of the various soil types and phases described in this report, table 4 has been constructed, showing the general productivity of each soil type for the important crops grown in this area. The rating of each soil type for any particular crop represents the relative productivity of that soil as compared with the ideal land within the United States for that crop. Thus, ratings grading from the lowest grade (0) to the best (10) are established for several important crops.

From a consideration of these indexes for separate crops, a general productivity or agricultural rating is given (in column 2) for each soil type for crops in general. For this purpose the more staple, commonly grown crops are given the greater consideration. In this case a numerical rating of 1 is given to the highest grade of land; other numerical ratings, up to and including 10, are given for respectively poorer grades. Thus, those soils having a general productivity rating of 1 are considered the best (from an agricultural point of view) in the agricultural region which includes this county, and those having a rating of 10 are considered the poorest.

These values are to indicate, as nearly as possible, the natural productive capacity of the soil types, regardless of such important considerations as differences due to previous management and the accessibility of markets. The natural land type is distinguished by a particular combination of physical characteristics, principally climate, soil, relief, and stoniness. Of course, a great many subdivisions could be made, but the principal types of land in Crawford County are indicated on the soil map by soil types and phases. The natural productivity ratings are based on the ability of the land to produce, under a management capable of maintaining the natural level of productivity, but without irrigation, drainage, or the addition of lime and fertilizers.

For those soils on which lime and fertilizers are commonly used, a secondary rating is given (in parentheses) to indicate the approximate productivity index of the land when given the special treatment according to current methods within the section. Poorly drained land and areas subject to flooding are given additional ratings indicative of their probable productive capacity if furnished optimum drainage or protection from overflow. As in the case of the untreated land, the standard of reference is the best land (untreated) for that crop in the United States. For purposes of this classification the cost of these treatments is not considered; special factors influencing cost would operate differently from one area to another.

The reader must be clearly aware that this classification is not to be interpreted directly into specific land values. The intention is to confine attention to essentially permanent factors of natural productivity and not to include transitory economic considerations. In some instances the information on which to base the ratings is not so complete as desired; in these cases further study may suggest changes.

TABLE 4.—*Classification of land in Crawford County, Wis., according to its*

Soil type	Productivity rating [1]	Crop productivity						
		Corn (grain)	Corn (silage or fodder)	Oats	Barley	Tobacco	Timothy and alsike	Red clove
	Grade no							
Ray silt loam	2, drained [5]	8	10	7	7	8	10	
	3, undrained [6]	5	7	5	6	5	8	
Wabash silt loam	2, drained [5]	8	10	7	7	8	10	1
	8, undrained [6]						9	
Wabash fine sandy loam	3, drained [5]	7	8	5	6	8	8	
	6, undrained [6]	2	3	2	2	2	6	
Ray fine sandy loam	3, drained [5]	7	8	6	6	8	8	
	4, undrained [6]	5	7	5	5	4	6	
Alluvial soils, undifferentiated	3, drained [5]	7	8	6	6	6	8	
	9, undrained [6]							
Bates silt loam	2	8	8	9	9	8	9	
Tama silt loam Waukesha silt loam Clinton silt loam	2	8	8	9	9	8	9	
Dubuque silt loam, deep phase Bertrand silt loam	3	7	7	8	8	7	7	
Bertrand silt loam, heavy-subsoil phase	4, undrained	6	6	7	7	2	7	
	3, drained	7	7	8	8	5	7	
Bertrand silt loam, rolling phase Boone silt loam Boone silt loam, valley phase Boone loam Clinton silt loam, valley phase	4	5	5	6	6	5	6	
Dubuque silt loam	5	4	4	6	6	3	6	
O'Neill fine sandy loam Bertrand fine sandy loam O'Neill sandy loam	4	5	5	5	4	6	5	

[1] Land having the highest general agricultural productivity in the agricultural region in which it occurs is rated grade 1 for
in column 2, the upper figure refers to the grade number when the land is drained or protected from flood, and the lower figure re
or unprotected from flood

[2] Land most productive for the specified crop in the United States=10 Figures in parentheses indicate the productivi
use of soil amendments, as lime, fertilizer, and manure.

[3] Vegetables doing best on highly organic soils, e g , onions, celery, lettuce

[4] Vegetables not requiring highly organic soils, also small fruits and melons

[5] Land with optimum protection from overflow

[6] Land with no protection from overflow

TABLE 4.—*Classification of land in Crawford County, Wis., according to its natural*

Soil type	Productivity rating	Crop productivit						
		Corn (grain)	Corn (silage or fodder)	Oats	Barley	Tobacco	Timothy and alsike	Red clove
	Grade no							
Boone fine sandy loam	5	4	4	4	4	5	4	
Clinton silt loam, steep phase	[1] 6	1	1	3	3	1	5	
Dubuque silt loam, steep phase								
Boone silt loam, steep phase								
O'Neill loamy sand	5	3(5)	3(5)	3(5)	2(4)	3(6)	1(3)	1(
Sparta loamy fine sand, brown phase								
Boone fine sand	8	1(3)	1(3)	1(3)		1(4)	1(3)	1(
Rough broken land	10							

[1] Steep or stony land, on which tillage is extremely difficult

NOTE.—In the case of items such as tree fruits, vegetables, small fruits, and melons, which include a group of associated that member of the group best adapted to the land in question. Thus, land well adapted to apples may be expected to have a peaches or other fruits may be poor.

SUMMARY

Crawford County is a deeply dissected plain or plateau, comprised of comparatively narrow rolling ridge lands, steep rocky valley slopes, and comparatively narrow valley floors.

The elevation ranges from 615 to 1,224 feet above sea level.

The original vegetation consisted for the most part of oak, hickory, maple, basswood, and other hardwoods.

The first settlements were made in 1781, but extensive settlement throughout the county started about 1840. Prairie du Chien, the only city, is the county seat.

Transportation facilities are satisfactory for marketing needs.

The climate is characterized by moderately long cold winters and short but warm summers.

Wheat growing was the principal agricultural industry until shortly before the beginning of the twentieth century, but at present dairying, livestock raising for meat production, and growing some cash crops are dominant.

Hay has the highest farm value of all crops grown, corn ranks second, and oats third.

Tobacco is the most valuable cash crop, its value being about equal to that of the oat crop.

Soil fertility is maintained by the use of barnyard manure, legume-hay crops, and to a smaller extent by the use of commercial fertilizers.

Between 90 and 95 percent of the soils have a silt loam surface soil. The dominant soils are the light-brown silt loam ridge-land soils—Clinton silt loam and Dubuque silt loam.

○

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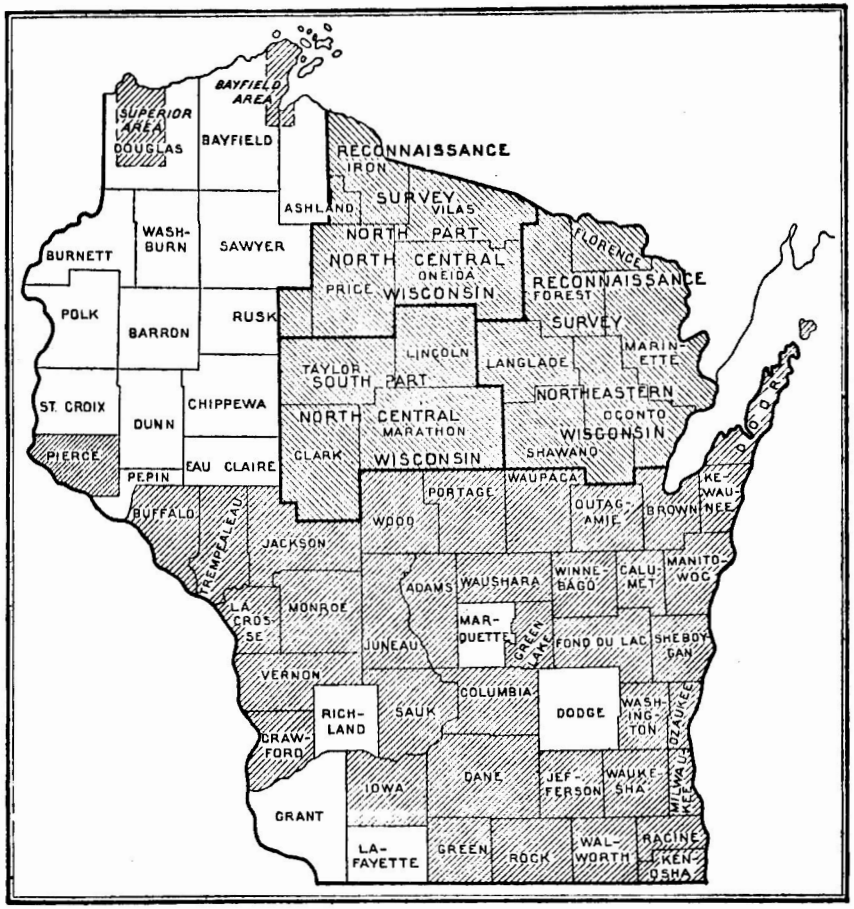
There shall be printed, as soon as the manuscript can be prepared with the necessary maps and illustrations to accompany it, a report on each soil area surveyed by the Bureau of Chemistry and Soils, Department of Agriculture, in the form of advance sheets bound in paper covers, of which not more than two hundred and fifty copies shall be for the use of each Senator from the State and not more than one thousand copies for the use of each Representative for the congressional district or districts in which a survey is made, the actual number to be determined on inquiry by the Secretary of Agriculture made to the aforesaid Senators and Representatives, and as many copies for the use of the Department of Agriculture as in the judgment of the Secretary of Agriculture are deemed necessary.



Areas surveyed in Wisconsin, shown by shading. Detailed surveys shown by northeast-southwest hatching; reconnaissance surveys shown by northwest-southeast hatching

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SOIL MAP
CRAWFORD COUNTY
WISCONSIN

WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY
ERNEST F. BEAN, DIRECTOR
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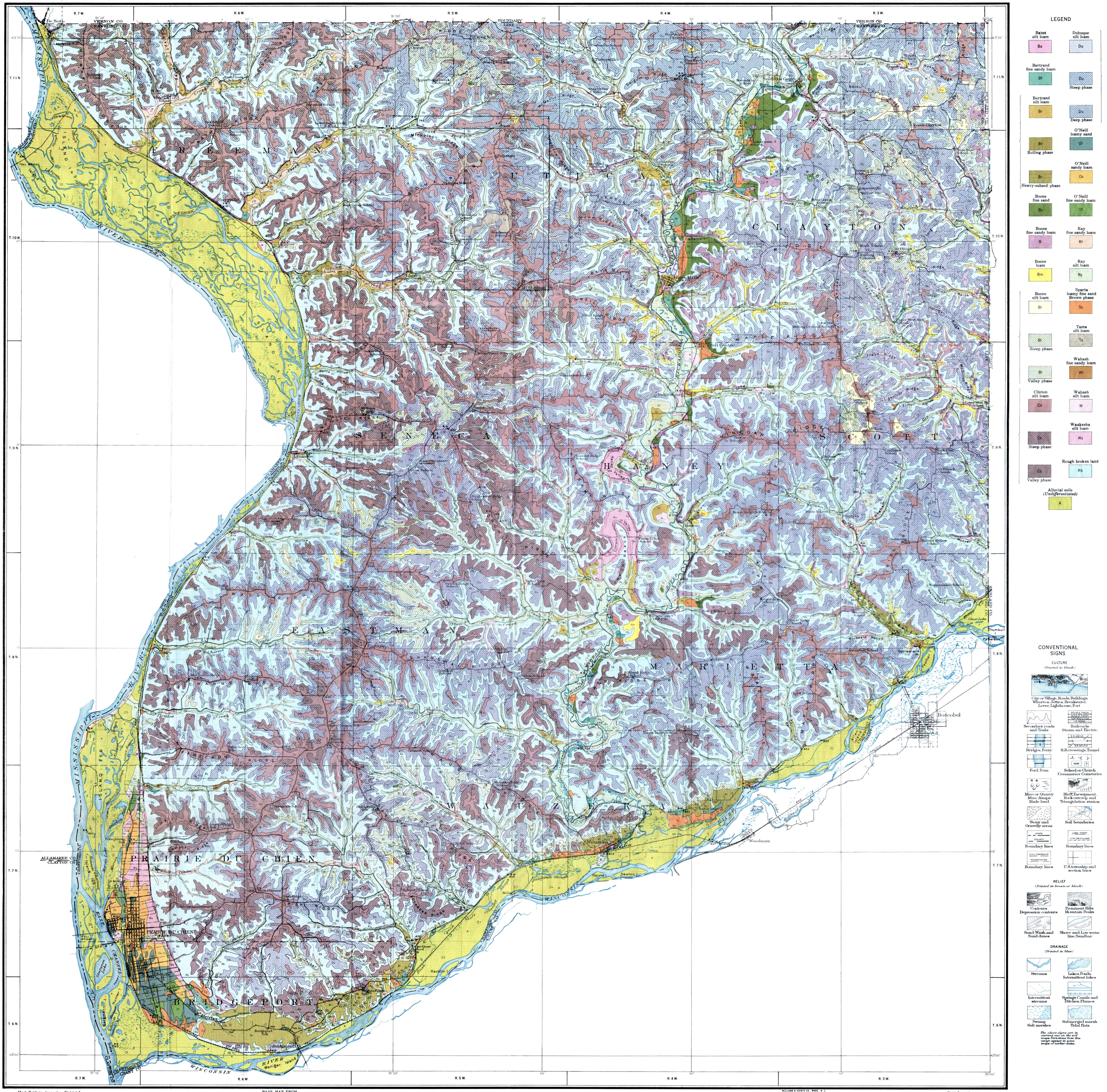

Mark Baldwin, Inspector, District 1.
Soils surveyed by M. J. Edwards, in charge, and W. J. Geib, U. S. Department of Agriculture, and Olaf Larson, D. E. Wilcox and E. H. Tyner, Wisconsin Geological and Natural History Survey.

BASE MAP FROM
U. S. GEOLOGICAL SURVEY SHEETS

Scale

Miles

Kilometers

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